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ABSTRACT

This document contains eight papers on the changing faces of virtual education. "Introduction" (Glen M. Farrell) presents an overview of the study during which the papers originated. "The Changing Venues for Learning" (Vis Naidoo) discusses innovative learning venues and forces driving and constraining their development. "The Continuing Evolution of ICT (Information and Computer Technology) Capacity: The Implications for Education" (Tony Bates) explores key emerging technologies and forces driving and constraining them. "Object Lessons from the Web: Implications for Instructional Development" (David Porter) examines the following topics: learning objects and structured information; ways structured content is developed; the structure of groups and their work; and implications for educational organizations, instructional developers, and learners. "The Provision of Learner Support Services Online" (Yoni Ryan) reviews options for providing learner support in distance education and issues for policymakers and managers. "The Development of New Organizational Arrangements in Virtual Learning" (Peter J. Dirr) reports on new virtual education institutions, consortia of institutions, commercial initiatives, and government-education alliances. "Quality Assurance" (Andrea Hope) explains the need for quality assurance in online education and ways of providing it. "Issues and Choices" (Glen Farrell) explores forces driving and constraining virtual education and myths, opportunities and risks of virtual education. (Some papers contain substantial bibliographies.) (MN)

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The Changing Faces of Virtual Education

DR. GLEN M. FARRELL, EDITOR

The Commonwealth of Learning
Vancouver, Canada

The Commonwealth of Learning is an International Organisation established by Commonwealth Governments in September 1988, following the Heads of Government Meeting held in Vancouver in 1987. It is headquartered in Vancouver and is the only Commonwealth intergovernmental organisation located outside of Britain.

The purpose of The Commonwealth of Learning, as reflected in the Memorandum of Understanding, is to create and widen access to education and to improve its quality, utilising distance education techniques and associated communications technologies to meet the particular requirements of member countries. The agency's programmes and activities aim to strengthen member countries' capacities to develop the human resources required for their economic and social advancement and are carried out in collaboration with Governments, relevant agencies, universities, colleges and other educational and training establishments among whom it also seeks to promote co-operative endeavours.

The Chairman of the Board of Governors is Dr. H. Ian Macdonald and COL's President and Chief Executive Officer is Dato' Professor Gajaraj Dhanarajan.

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Dr. Glen M. Farrell, editor

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Foreword

This study is a report on some of the major developments that are influencing the evolution of virtual education. It examines not only the nature of these developments, but also the implications for the use of virtual education models, particularly in developing countries. It follows up on our first volume *The Development of Virtual Education: A Global Perspective*. Since the release of that report in 1999, numerous other publications have made their appearance, each contributing in a significant way to the increased level of activity in the field.

This second volume is not an attempt to describe what is happening in the world of virtual education, but more about *where*, *why* and *how* virtual education is happening. By continuing to monitor developments, we hope to capture major trends, identify critical challenges and consider emerging opportunities as technologies improve, access to those technologies increase and skills to apply them are enhanced.

For The Commonwealth of Learning, this study will be of great value as we explore options to carry forward the instruction given to us by the 14th triennial Conference of Commonwealth Education Ministers in Halifax, Canada in November 2000. That instruction required of us to establish a virtual university to serve small states. While we are excited about the instruction, we are also mindful of the enormity of the task. We would not wish to embark on it without gaining adequate knowledge of the requirements to establish such a facility. This study deals with some of those issues, and just as we intend to benefit from the findings, so too is it our hope that others, especially in the Commonwealth, will find the experiences described in this report of value.

The Commonwealth of Learning takes pleasure in acknowledging the effort and leadership given to this study by Dr. Glen Farrell, who also co-ordinated this investigation. We are also grateful to the group of experts who invested a lot of their time in making this study possible. This study was made possible by a grant from the Department for International Development, U.K., for which we are greatly indebted.

Dato' Professor Gajaraj Dhanarajan
President and Chief Executive Office
The Commonwealth of Learning
June 2001

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- **Dr. Glen Farrell, Team Leader.** Glen is the retired president of the Open Learning Agency of British Columbia. He is currently a consultant on the development of educational systems for a variety of clients, including The Commonwealth of Learning. E-mail: glenf@col.org
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Introduction

Dr. Glen M. Farrell

Background

In September 1998, The Commonwealth of Learning (COL), with funding from the Department for International Development (DFID) of the Government of the United Kingdom, commissioned a Study Team to prepare a report on the status of the development of virtual education from a global perspective. The analysis was comprehensive in that it included all levels from school to higher education. Virtual education was defined in two ways:

- The application of information and communication technologies (ICT) to core institutional functions such as administration, materials development and distribution, course delivery and tuition, and the provision of learner services such as advising, prior learning assessment and programme planning.
- As an organisation that has been created through alliances and partnerships to facilitate teaching and learning to occur without itself being involved as a direct provider of instruction.

The report of the Study Team, *The Development of Virtual Education: A Global Perspective*, was tabled in June 1999 (Farrell, 1999). It provided a snapshot of the state of virtual education development in the major regions of the world along with a general synthesis of the trends, issues and forces shaping its development. The report also recognised that virtual education is an extremely dynamic phenomenon.

Indeed that has proven to be the case. There has been an immense increase in activity since the publication of the report. The international environment has changed remarkably with respect to the application of ICTs at all levels of education. For example, most educational institutions are developing or planning to develop Web-based course delivery capability. As well, a significant number of government, institutional, corporate and private Web sites have emerged to chronicle the burgeoning numbers of virtual education initiatives. Further evidence of this increased activity is presented in some recent studies that have examined the processes of "e-education" (Bjarnason et al., 2000; Cunningham et al., 2000; Erhmann, 2000; Kerry et al., 2000, Johnston et al., 2001).

The explosion of interest in virtual education over the last two years underlines the point made by COL in its initial proposal to DIFD for funding to support a study of the development of virtual education. It stated that "the provision of education will be the biggest challenge for most governments as they attempt to attain the ideal of peace, freedom and social justice, while striving at the same time to position themselves to generate more wealth and compete in a global market." And that statement is now being borne out by governments and international development and aid organisations that are experiencing a growing sense of urgency to respond to the challenge of providing education in a changing global market. They are recognising that it cannot be done effectively without substantive reform to their education systems.

There are several global forces (CIA, 2000; UNESCO, 1998) that are serving to raise the sense of urgency:

- World population in 2015 will be 7.2 billion, up from the current 6.1 billion. Ninety-five percent of the increase will be in developing countries. People in most countries will live longer, which will add to the demand for access to education as well as for health-care and other services.
- Globalisation, the largely unrestricted flow of information, ideas, cultural values, capital, goods and services, and people, which is driven by the global networked economy, will enhance not only the demand for education, but create need for more diversified content and greater flexibility of access. However, two trends running parallel to the globalisation process will have a significant impact on the development of global systems of virtual education. These are the creation of more small and medium-sized enterprises and an increasing desire to defend cultural, linguistic and religious identities.
- Each of these trends complicates inter-institutional collaboration and mitigates against the flow of globalised content across borders.
- Exponential growth of scientific knowledge continues to be accompanied by a widening gap between developed and developing countries, the latter being unable, single-handedly, to acquire the basic infrastructure necessary to access that knowledge.

Cunningham et al. (2000), in the comprehensive analysis *The Business of Borderless Education*, identified the following forces as driving the growth of what they called the "alternative education market" in those jurisdictions:

- The globalised economy, with a growing demand for standardised products, services and technical infrastructure, and sophisticated communication systems.
- The emergence of a post-industrial information age and the explosive growth and distributed nature of new knowledge.
- The demands for greater access to tertiary education fuelled by rapid changes in the economy, the need to maintain and upgrade skills for employment, and industry's demand for "work-ready" graduates.
- The growing reluctance on the part of governments to fund the increasing demand for higher education.

The Context

The educational strategies that are being deployed in response to these forces may variously be called "virtual education," "distance education," "distributed learning," "online learning," "Web-based learning," "e-education," "e-learning," or any one of a number of other labels. Current strategies typically involve the use of digital networks, either synchronously or asynchronously, for:

- The delivery and tuition of courses.
- Management of administrative services such as registration, records, fee payment, etc.
- The provision of learner support services.

However, whatever the label used to describe these current strategies, they all have their roots in the practice of distance education. A recent report from the American Council on Education (ACE) states:

> The new distance education force transforming higher education may not be controlled by the traditional structures or providers of education or by traditional academic policies. Not only do the new forms of education portend a change for student populations, but also they will force faculty to develop new modalities of teaching and administrators to provide a new infrastructure for support. As a result, the advent of distance education is forcing many institutions to review and amend many of their existing policies and procedures (Parrish and Parrish, 2000).

Other authors have described the increasing use of ICT as an evolutionary process that has been underway for some time. Tapsall and Ryan (1999), writing from an Australian perspective, describe the evolution of delivery modes in terms of three phases: distance education, open learning and flexible learning. They argue that the first phase, distance education, emerged in response to the needs of learners who were unable to access campus-based institutions because of geographical distance and/or work and personal commitments. The second phase, open learning, while also responding to the problems of distance, is primarily focused on meeting the needs of those who are disadvantaged in terms of entry qualifications and, therefore, need to be served through "second chance" enrolment policies and alternative programmes and delivery models. Finally, they argue that the third phase, flexible learning, in the context of Australian universities, is less about distance or disadvantage than about providing "more" education to "more" students (anywhere, anytime) at "less" cost. Flexible delivery modes, using CD-ROMs and the Internet, are being used as much as a solution to on-campus problems as they are to off-campus access. Tapsall and Ryan claim that, as a result, face-to-face and distance and open learning modes are converging. Students in all types of venues are increasingly learning through the use of the same technologies.

Peter Dirr (1999) offers yet another view of the evolution of ICT applications in higher education. As he sees it, two features have characterised the process. One is that the technology application decisions have been driven primarily by technology, not by consumers. The other is that the applications have been to a traditional academic paradigm. He points to the widespread use of video-conferencing, which has enabled instructors to retain many of the old pedagogical methods, but has done little to accommodate the learner's need for flexibility. Dirr argues that institutions have failed to employ the full potential of newer technologies and have not taken full advantage of the resources available to both learners and instructors.

Jim Taylor (1999) has suggested that this evolutionary process is about to enter a fifth phase. In his schema, the first generation of distance education, the correspondence model, was based solely on print technology; the second, the multimedia model, was based on print, audio and video technologies; the third, the tele-learning model, involved the application of telecommunications technologies to provide opportunities for synchronous communication; and the fourth, the flexible learning model, is based on online delivery via the Internet. Taylor argues that even though this fourth generation of distance education is still gathering momentum, a fifth generation is beginning to emerge. It will use automated response systems that scan the text of incoming e-mail and respond intelligently without human intervention, thereby decreasing the cost of online tuition and increasing access to learning opportunities on a global scale. Taylor calls this the "intelligent flexible learning model" that will enable a quantum leap in economies of scale and cost effectiveness.

Stephen Ehrmann (2000) has another perspective. He says that, "Many institutions are searching for a unifying vision to guide their investments in teaching, learning and technology.

Some of them hear a thundering herd of innovations collectively referred to as *distance education* and *learning anytime anywhere for anyone* and are wondering if their campuses even have a future."

Ehrmann contrasts the concept of the "campus-bound" paradigm with the "campus-based" paradigm. The former assumes that the quality of a programme depends entirely on the books, laboratories, faculty members, students, etc. that are on-site. But the latter, which he calls the new paradigm, assumes that some of the resources and some of the learning are off-site. Networks enable staff and students to use a World Wide Web of academic resources and, as a result, they may only be on campus part of the time.

It was stated earlier that there are many labels used to describe this evolving process of adopting ICT to enhance educational processes. The foregoing review puts that in context. The reality is that some institutions are less advanced than others, yet no one wants to use a label that isn't thought to be the most current — such as virtual education! The review illustrates just how quickly the nature of virtual education is changing.

The Motivation for Further Study

The 1999 report on the global status of virtual education (Farrell, 1999) was well received, and COL was encouraged to continue to monitor virtual education developments, which it has since done routinely as part of the overall information resource-gathering activities of the organisation. Changes in COL's strategic priorities have also heightened this interest in pursuing further study of virtual education activities. The Commonwealth Ministers of Education, at their meetings in Halifax in November 2000, endorsed the Three-Year Plan put forward by the COL Board of Governors. Capacity-building is one of the key roles described in the Plan. It calls for COL to "create programmes and models incorporating different technologies and learning media and demonstrating the ways in which they can be applied to build capacity wherever there is need" (COL, 2000). The Commonwealth Ministers (2000) also called upon COL to "establish a virtual university for small island states using existing structures and capacities."

In July 2000, COL invited the Study Team Leader of the 1999 report to review the available literature on virtual education and issues related to the use of ICT in education and to recommend whether a follow-up study should be undertaken. This exercise determined that current developments in virtual education are comprehensively "chronicled" in new Web sites, recent studies, organisation newsletters and in the education press. Therefore another "snap-shot" study by COL would not add substantially to what already exists. However the review and analysis did result in the following observations:

- The growth of virtual education initiatives is largely occurring in countries with mature economies and established institutional and ICT infrastructure.
- There is widespread recognition that the need for models of mass education is greater in developing countries as they face the challenges of equipping their people with the skills and knowledge needed for economic and social development in a globalised environment. The causes of the "digital divide" must be addressed if virtual education is to be a meaningful part of the educational reform process in these countries (Kenniston and Kumar, 2000).
- A remarkable feature of this surging interest in online virtual learning is that it remains largely focused on ways to use technology that will make the current products of educational institutions (i.e., programmes and courses) more accessible, flexible, cheaper and attractive to learners and, from the institutional

perspective, provide a means of generating revenue to support the traditional on-campus model.

- While this focus is not inappropriate, there are several trends emerging that are likely to bring about radical changes to the way we think about the concepts of campus, curriculum, course, teaching/learning processes, credentials/awards, and the way that ICTs can be utilised to enable and support learning. These trends include the following:
    - The development of community-based facilities to enable access to ICT appliances, connectivity and educational resources.
    - New ways to develop and store content as "learning objects."
    - A growing concern about how "quality" can be adequately ensured in a virtual education environment.
    - The development of new organisational models to facilitate virtual education processes.
    - The provision of learner support services using ICT.
    - The continuing evolution of ICT.

The report to the COL President described these trends as "macro developments" and proposed that they be the basis for a in-depth study in order to investigate their likely impact on the development of virtual education. It was suggested that such a study, while of general interest, should be undertaken to see what promise these trends might hold for addressing the barriers to the expanded use of virtual education in developing countries. This was agreed to and, with the continuing support of DFID funding, a study was designed to achieve the following objectives:

- Identify and describe trends related to educational applications of ICT that are modifying the core products and processes of education (e.g., programmes, syllabuses, courses, delivery models and teaching venues).
- Examine the implications of these developments for stakeholders and organisational arrangements, particularly those in the developing countries of the Commonwealth.
- Make recommendations regarding strategic decisions in light of these developments.

Study Methodology

The study evolved in three phases:

- **Phase one** focused on the identification and validation of the selected trends. The Study Team Leader drafted the initial set of macro developments and circulated them electronically, along with a general description of the nature of the study, to a selected focus group of approximately 30 people around the world. These people were all currently involved in some aspect of virtual education as practitioners, academics, policy leaders and administrators. They were asked to consider the macro developments put forward in terms of the following questions:
    - Do you believe these to be significant trends in terms of their current and future impact on the development of virtual education?
    - Is the description of each trend clear and sufficient?
    - Are there other trends that you believe to be more important than any one of those listed?

Twenty-eight responses were received and used as the basis for reconsidering and rewriting the descriptions of the macro developments. These descriptions are included in Appendix 1.1.

- **Phase two** involved the identification of a lead author to prepare a paper on each of the selected macro developments according to the following guidelines:
    - Describe the nature of the "macro development."
    - Describe how it is developing in terms of its form(s) and context and in terms of the current stage of development in different parts of the world (i.e., North America, Europe, Africa, South America, Australia/New Zealand, India/Asia).
    - Provide case examples that illustrate the nature of the development.
    - Identify the driving and constraining forces influencing the development.
    - Describe the major issues the macro development is creating with respect to the policy and practice decisions facing education leaders, keeping in mind that the focus of the study is across all education levels.

The papers written by the lead authors provide the core content of this report. Each person was responsible for his or her paper within the above framework; however they all were encouraged and enabled to work as a team to share information, debate ideas and respond to each other's questions. A project listserv was available to facilitate interaction. (See the Acknowledgements for a list of all the authors.)

- **Phase three** began with the Study Team convening at a workshop in Vancouver in March 2001 for the purpose of reviewing the papers and discussing the probable impacts of the macro developments on the evolution of virtual education and the various issues that are likely to arise. The analytic framework used was as follows:
    - The consumers of education (the learners) at all levels.
    - The suppliers of education and training.
    - The delivery learning opportunities.
    - The nature, organisation and structure of content.
    - The "core business" processes of organisations.
    - The policy and strategic leadership issues that arose from the analysis.

The Study Team Leader acted as the facilitator for the workshop and drafted the summary document based on the findings from the workshop. This summary constitutes the concluding paper in this report (see Chapter 8).

* * *

Change in education systems is always in pursuit of one or more of the following goals:

- Improvement of access to educational opportunities.
- Enhancement of quality in terms of both standards achieved and the learning process.
- Improvement of efficiencies such as increased productivity, greater return on invested capital and cost reduction or containment.

The macro developments discussed in this report will have an impact on each of those goals and, in the process, shape the way virtual education develops in the future. COL hopes this report will be useful to educational leaders and policy-makers generally as they grapple with the complexity of establishing strategic priorities in a complex and dynamic environment. However, its more fundamental purpose is to provide a comprehensive analysis of the elements and processes that need to be considered in the development of virtual learning models for COL as it undertakes its various efforts to assist developing countries in the Commonwealth to meet their educational challenges.

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APPENDIX 1.1
Current Macro Developments in Virtual Education

The Changing Venues of Virtual Education

One of the conclusions of the 1999 COL study was that the lack of access to connectivity and learning technology appliances, particularly in developing countries, is a major constraint to the use of ICT in education. The "learning centre" concept has emerged as an essential strategy to address the problem. It is represented in a variety of forms such as multi-purpose telecentres, regional centres of institutions, community-based learning centres, mobile learning centres, telecommuting centres and, at a global level, by the World Bank's Global Development Learning Centre Network. There is a substantial body of literature regarding this phenomenon as it relates to the development of ICT infrastructure, particularly the use of telecentres to create access to communication appliances and connectivity. However there is very little mention of it in the context of the development of virtual education models, yet it will surely modify the way we think about the concept of a "campus."

Learning Objects: The Emergence of Standardised Instructional Design Processes

Learning objects can be described as the competencies to be achieved, skill and knowledge outcomes, lesson plans, assessment items and learning resources. They can exist in a variety of forms such as books, articles, people, Web sites, images, audio and video pieces. They can be stored in databases and used, reused, aggregated as desired or re-purposed by learners, teachers and course designers for their own particular purposes, thus moving us towards a "learning-on-demand" environment. And they can be accommodated within various delivery models such as print, CD-ROM or Web-based. The use of common standards will make these learning objects databases accessible to any organisation that shares the same standards. A consortium of more than 600 institutions has established a task force to identify the standards for this initiative (Porter, 2000). This development is already starting to change the way we think about the notions of curriculum and courses.

The Provision of Learner Support Services Online

Access to services such as career counselling/ advising, assessment of current skills and knowledge, development of learning plans, content quality assurance, credit transfer and the provision of credit banking and personal records of learning are critical to the evolution of online content delivery. However, the literature of virtual education largely ignores them, perhaps because it is assumed that these support services will be provided through the historical processes. However, there are emerging examples of technology-based strategies for providing these support services that promise to make them more accessible, affordable and relevant to the needs of online learners. In this regard, the "customer relationship management systems" that are emerging in the business world are providing some useful insights..

The Development of New Organisational Arrangements

Over the last two years there has been an explosion of new organisational forms in education, particularly at the post-secondary level and in the area of company staff training. These new organisational forms are the result of partnerships between businesses and institutions, joint venture initiatives between and among institutions and organisations, new consortia arrangements and a huge increase in the number of new "for profit" education and training organisations. They are developing for a variety of reasons: to gain market share in a globalised educational world, to take advantage of value-added partnership opportunities, to reduce costs and share risk, and to profit from a burgeoning demand for life-long learning.

These new organisational arrangements have an impact not only on learners, but also on the management of human resources. Primarily, this concerns the role, rights and working environment of faculty. This issue is not ignored in the literature (Parrish and Parrish, 2000), however there has not been a comprehensive look at what strategies are being implemented to deal with such issues as copyright, tutoring loads, tenure issues, job security, etc. The assumption appears to have been that the extant human resource policies can be transposed to the online education environment. The number of virtual education initiatives that seem to have failed because of an inability to deal with these issues would suggest otherwise.

Quality Assurance

One of the consequences of the growth in popularity of distance education has been increased concern about an erosion of academic quality. In the face-to face teaching environment of the institutional classroom, quality is supposedly assured by managing the qualifications of the teacher who, in turn, has total control of the pedagogical process. As the application of learning technologies has served to decrease the teacher's ability to directly monitor and control the learning environment, these traditional quality assurance strategies have broken down. This has led to a growing concern within institutions about the quality of learning that is provided at a "distance." While some argue that this concern is really a mask for the perception that distance learning will threaten jobs in the academy, others admit that, in the brave new world of e-learning, there is a need to have valid and reliable measures of content and pedagogical quality that are appropriate — both to assist learners in their choice of provider as well as to ensure the validity of competencies implied in the granting of credentials. New models for addressing this need for quality monitoring and assurance are emerging and, in the process, are changing both the concept of educational quality as well as the processes by which it is adjudicated.

The Continuing Evolution of ICT Capacity

Some of the forces that were identified in the 1999 study as constraining the development of virtual education were the lack of access to technology appliances, Internet connectivity and a lack of bandwidth to permit full multimedia use of the Internet. Developments on the horizon such as wireless networks, fibre optics, voice recognition and infrastructure development will lessen these constraints. These will allow the use of online education in ways that will beg the imagination of instructional designers — and the caution of policy-makers! Educational leaders must be able to justify the cost of ICT investments in terms of the benefits to be gained and weigh those costs against other needs such as building more schools, hiring more teachers, etc.

2

The Changing Venues for Learning

MR. VIS NAIDOO

Introduction

Historically, the learning process has taken place within the infrastructure of institutions such as schools, university campuses, technical colleges, etc. The need to be part of such institutions was driven by the notion that to access information and knowledge, a learner had to be present where the teacher was. The first separation between the teacher and the student occurred with correspondence education, which offered information and knowledge mediated by some format of media, usually print. This early form of distance education moved the learning venue to the learner's home.

The development of information and communication technology (ICT) and its application to education and training has increasingly allowed institutions to deliver learning in a variety of venues. Now, the choice of venue is driven by, among others things, the ability to access the learning materials using ICT. Many potential learners do not have ICT in their homes, so there is a need to find alternative ways to access such learning experiences.

Institutions using ICT as the delivery platform for learning can be defined as virtual institutions. This chapter focuses on the issue of access to virtual education. It describes the increased need for quality education and the role of ICT in increasing access, particularly in developing countries where education and training is crucial to economic and social development.

The chapter also describes the traditional learning venue and how it is changing in order to increase access to virtual education and training. There are different driving and constraining forces behind this development, and these are examined as well. The chapter ends with an outline of four major considerations that need to be addressed if these innovative learning venues are to be developed and sustained to deliver quality education and training to learners.

Access to Connectivity and Learning Technology Appliances

THE INCREASING NUMBERS

Enrolment in all sectors of the education system has increased in recent years. It is estimated that "two trillion dollars or one-twentieth of global gross domestic product" is spent on education (Guttman, 2000). Roughly speaking, one-fifth of this amount is being spent by the private sector while the rest is spent by governments on the public education system.

International and national campaigns such as "education for all" have succeeded in drawing learners into the education system, but the development of distance education opportunities has also had much to do with the growth in numbers. Research conducted by the International Data Corp indicate that "distance learning enrolments are growing by 33 percent and will reach 2.23 million in 2001" (DeVeaux, 2000).

Many students are attracted by the prestige of off-shore degrees, and this trend it likely to continue as distance and virtual education continue to develop. In a recent travelling "road show" by three major U.S.-based universities, Lynne McNamara (Director of Programmes Development in Asia for the University of Maryland University College) projected that her university expects to have 70,000 to 80,000 online students by the end of 2001, many of them from Asia (Brender, 2001).

The private sector has also supported and been a driving force behind the increase in participation in distance and virtual education. Employees who want to advance their careers, but who can't afford to take the time out to study at contact institutions, are attracted to virtual learning opportunities. Many corporations recognise the benefits of supporting such studies: they save both in training-related travel expenses and in employee productivity.

THE IMPACT OF ICT

New technologies have made "the walls of the learning space transparent, providing a freedom for the learner to explore sources of information outside his institution, even outside his country" (OECD, 1994). While ICT has undoubtedly opened new avenues for increased numbers of learners, it has also opened new areas of research focusing on the role of pedagogical processes when using new technologies and on their impact on cognition.

Kofi Anan, the United Nations Secretary General, has noted the broader impact of ICT, asserting that:

> Recent developments in the field of communication and information technology are indeed revolutionary in nature. Information and knowledge are expanding in quantity and accessibility. In many fields, future decision-makers will be presented with unprecedented new tools for development. In such fields as agriculture, health, education, human resource and environmental management, or transport and business development, the consequences could be revolutionary. Communications and information technology have enormous potential, especially for developing countries, and in further sustainable development. (Mansell and Wehn, 1998).

The use of ICT is a vital component of the new "information economy" and "information society." Mansell and Wehn (1998) also point out that the term "knowledge society" has enabled a shift away from technology as a driver of change to a tool that offers new ways of combining the information available with people who will drive development. This shift pressures countries to develop education systems that enable skilled people to work within the knowledge society and within the global economy. The result of such pressure on both developing and developed countries has been a massive increase in education and the drive for qualifications.

The rapid development of virtual education is most noticeable in the developed world where there is much greater access to educational institutions and learning technologies, especially computers, CD-ROMs and the Internet. In the developing world, limited access to ICT is apparent. A recent report by eMarketer (Dennis, 2000) noted that only 229.8 million or 5% of the world's population is online. The report also notes that this number is likely to increase to

640.2 million by 2004, which will represent approximately 14% of the world's population. Figures from U.S. government officials are slightly more generous. They put the number of people connected to the Internet at 332 million, with only 1% living in Africa. And less than 5% of the computers connected to the Internet are in developing countries. (See info@balancingact-africa.com, 15 Jan 2001.) The figures proposed by the International Data Corp estimate that by 2003, the number of Internet users worldwide will grow to about 508 million, up from 87 million in 1997 (Smith, 2000).

As access increases, in the corporate world, companies will focus on their ability to exploit Internet and e-commerce opportunities. Employees will need to rapidly develop their knowledge and skills to use the technology and to re-design the business process. Many businesses will encourage in-house and distance education and training, and they will complement this with e-learning. One prediction suggests that by 2003, less that 30% of formal corporate learning programmes will employ the traditional classroom model (Galagan, 2000).

Because the above projections were made prior to and during the crash of the technology market of 2000/2001, some argue that they are incorrect. However, the effect is likely to be minimal. Current research indicates that while the education market has "declined in tandem with other sectors that make up the Internet economy, the sector encompassing corporate e-learning providers and companies serving the K–12 and higher education markets hasn't suffered more than other sectors anchored in Internet technologies" (Barron, 2001). Barron notes that many companies view e-learning as a strategic necessity that is vital in today's knowledge economy. He goes further to note that e-learning and broader educational technology areas are faring relatively well in a slowing economy.

LIMITS TO ACCESS

While ICT makes it possible for many potential learners in many parts of developing countries, including remote and rural areas, to have access to education, such access is very limited. There are a number of technological constraints that restrict virtual education. For one, the telecommunications infrastructure (telephone and other communication facilities) outside many of the major cities in developing countries are limited and inadequate. A few examples illustrate the problem:

- Africa has approximately 12% of the world's population, but only 2% of the global telephone network. Telephone density is less than two lines per 1000 people. These figures become even more startling when compared with Asia (48 per 1000), America (280 per 1000), Europe (314 per 1000) and high-income countries (520 per 1000) (Darkwa and Mazibuko, 2000).
- Nigeria is the most populous country on the African continent. However, the services provided by its state-run phone company, NITEL, are meagre for a country of 108 million people. In terms of the Internet, there are fewer than 500,000 lines connected.
- Internet reach in India doubled from a subscriber base of one million to over two million within six months in 2000. However, when this impressive figure is matched against the total population of India of one billion, you get the sense of the magnitude of the lack of access to computers and the Internet.
- The situation in Latin America indicates huge disparities. In the mid-1990s, few people in South America, rich or poor, owned a computer or had access to the Internet. The changes have been dramatic over the last few years. Now 35 million Latin Americans own PCs and 20 million use the Internet, but the

poor have been largely left out of this development. In Brazil, for example, 72% of the 7.7 million Internet users are from the wealthiest fifth of society, with only 8% coming from the poorest fifth. (Margolis, 2001).

Both developing and developed communities have responded in different ways to these and other constraining factors to virtual education (discussed later in this chapter). One key response has been to redefine the nature and function of learning venues that enable virtual education.

The Traditional Nature of Learning Venues

The world is changing rapidly in all areas — in the environment, in the economy, in technology and in education. While it is important to spend time pondering the implications of such change, perhaps it is more important to consider the implications of the changes to education. The education system should be the key platform that enables young people to develop the necessary skills required to prepare for the changing world.

The introduction of ICT to support virtual education has generated a range of discussion, generally focusing on the value of using the technology for this form of education delivery. Often such discussion illustrates a lack of unanimity on the issues that need to be addressed for the effective use of technology to support virtual education. However, there are three issues that seem to generate consensus by all people involved in education: costs, decision-making and access.

The COL study on virtual institutions (Farrell, 1999) noted that the lack of access to learning venues and the lack of access to connectivity and learning technologies within venues was a major constraint, particularly in developing countries. And it is this element of education, the "place" of the educational interaction, that is increasingly being seen as crucial to promoting access to virtual education.

In focusing on learning venues, a range of vital questions should be considered to guide the thinking on the spatial and social construction of such venues, These include:

- What are the implications for learning where students are able to access second opinions and further information to that provided by the textbook and teacher? How can the student access such opinions and information and what technology will best serve this purpose?
- What will the role of the teacher be in the context of different learning venues and environments? When does the teacher become the author, the expert, the tutor, the presenter and the facilitator? What learning space is required to enable the teacher to carry out these tasks?
- Increasingly there is a shift away from a class defined only by age to individually tailored education based on the requirements of each student. Using resource-based methods, institutions are able to cater to different students in terms of their capabilities, potential and stage of learning maturity. What are the implications of this for peer group relations, teachers, tutors and librarians? What are the implications in terms of the nature of the learning venue and its physical construction and its resources?
- Shifting away from mass groups of students to individual learning requires administrative and resource control systems that enable such learning to occur. What are the implications of this type of system for the learning space necessary for the learner to be successful?

(These questions are summarised from the Organisation for Economic Co-operation and Development (OECD, 1994).)

Such questions pose interesting considerations on the nature of the learning structure. The "buildings" may be a school; or part of other public buildings like libraries, town centres, community centres; or part of private buildings like shops, factories or telecentres. In constructing such "buildings," issues such as noise, connected and unconnected spaces, electricity and telecommunications, and public and private learning spaces need to be considered.

The Development of Innovative Learning Venues

The response of many developing and developed countries to ways of increasing access to virtual education has been to redefine the nature of learning sites. There are many terms used to describe these learning sites, including community learning centres, multi-purpose community centres, telecentres and derivations thereof.

COMMUNITY LEARNING CENTRES

A community learning centre (CLC) is a site where education programmes that are relevant to the needs of the community are made available to the members of the community. These centres are located in different types of buildings (e.g., public buildings, religious buildings, community halls, public schools). The key characteristics of community learning centres are "flexibility, responsiveness to local needs and the creative and efficient use of available resources and infrastructure" (Bester, 2001).

CLCs are often connected to various data sources and networks and use these connections to offer various opportunities such as:

- Offering services and resources based on local education and training needs.
- Providing access to formal and non-formal training and skills development programmes.
- Being a catalyst for communities to make use of their own resources.
- Providing information and communication according to community needs.
- Acting as access points for local and outside resources.
- Providing a base for community development forums (Bester, 2001).

MULTI-PURPOSE COMMUNITY CENTRES

Another term used to describe learning venues is "multi-purpose community centre" (MPCC). The term "multi-purpose" implies the various sectors that offer services such as information, housing, adult basic education and training, health, culture, small business development, various types of employment, welfare and social interaction (Bester, 2001).

MPCCs are gaining momentum. A single centre that enables the sharing of facilities and resources and that can offer a range of services is proving to be more cost effective and efficient. An MPCC is often seen as a "one-stop shop" that directly meets the education and training needs of both the individual and the broader community.

A further derivative of the multi-purpose community centre is the multi-purpose community learning centre (MPCLC). The MPCLC is seen as that component of the MPCC that is focused on education and training services. An MPCLC delivers multi-sectoral education and training, with formal education at certain times and non-formal at other times. In centres where different technologies are available, various virtual learning opportunities become available.

Note that in all the definitions discussed so far, two words are consistently used: *community* and *centre*. A community is often described as a role-player or stakeholder within a specific locality. These role-players are often organised forms representing specific groups with certain interests. An example of a community is the local residents' association representing all residents in a geographic area. A centre is the physical entity that houses the resources and technology that enable access to information and learning opportunities.

TELECENTRES

Of late, a new term, "telecentres," has been derived to describe a centre that offers various communication services. Telecentres are communal facilities consisting of a physical space that provides public access to ICTs for educational, personal, social and economic uses. The services offered range from basic telephony, fax and e-mail to full Internet connectivity (IICD, 2000).

In their paper on telecentres, Gomez, Hunter and Lamoureux (1999) have developed a typology of telecentres that describe the five different types: basic telecentre, telecentre franchise, civic telecentre, cyber café and multi-purpose community telecentre (MTC).

Basic telecentres

Basic telecentres are generally small operations that are either privately owned or run by non-governmental organisations (NGOs) as part of their services. The NGO operation is often funded by international donor agencies.

Basic telecentres are usually found in rural, marginalised or peri-urban areas that support poor communities with high levels of illiteracy. They usually offer "a mix of services including telephony, fax, computing, Internet, photocopying and related technologies" (Norton et al., 2000). As well, they often have a small number of computers that use dial-up connections to an Internet service provider (ISP). The key to the success of basic telecentres is that they are linked to the local community they serve and their workers are drawn from the local community.

Telecentre franchises

Telecentre franchises refer to a number of interconnected telecentres that are independently owned. As they are based on a franchise model, there is a centrally located organisation that facilitates technical and/or financial support.

Telecentre franchises generally have a small number of computers for public access and use dial-up connections to an ISP. While there is central support, the nature of the services offered differ according to needs of the community that is being served.

- In *Egypt*, three technology access community centres (TACCs) have been established in the delta. They have generated over 3000 community Internet users and trained hundreds of community members to use the Internet. This was done at a cost far less than the commercial cyber cafés.
- *Brazil* offers another example of the telecentre franchise model. At present there are 208 Computer and Citizenship Schools in 17 Brazilian states that have been established by the Centre for the Democratization of Computer Science (Margolis, 2001). These are autonomous and self-sustaining schools that are developing and carrying out a range of activities based on the needs of the different groups that they work with.
- The *Global Distance Learning Network* (GDLN) initiative of the World Bank has established 23 telecentre franchise operations in Africa (Benin, Côte d'Ivoire, Ethiopia, Ghana, Senegal, Tanzania and Uganda); Asia (China, Singapore, Thailand and Vietnam); Europe (France, Spain and Ukraine); Latin America and the Caribbean (Bolivia, Chile, Columbia, Costa Rica, Dominican Republic, Nicaragua and Peru); Middle East and North Africa (Egypt) and North America (U.S.A.) (see www.worldbank.org/gdln/dlcs.htm). These centres use state-of-the-art technology to promote learning and information sharing. Each centre is run and managed by the institution hosting it and offers courses and capacity-building programmes aimed at government officials, private sector representatives, NGOs, students and others.

While GDLN centres do not fit into the traditional model of telecentres, the services many of these offer reflect the telecentre functions, albeit at a higher level of technology. GDLN centres are designed to offer full multimedia connectivity and interaction, which runs independent of the local country telecommunications infrastructure. The centres are designed to have one room for live (synchronous) video and data interaction with a second room being used for computer and Internet-based activities. Other rooms are for the network communications equipment, training, administration, etc.

Civic telecentres

Civic telecentres are closest to the multi-purpose community centres (MPCCs) described earlier. They are probably the most common type of centre found in many traditional civic institutions (e.g., public libraries, schools, universities, community organisations that have buildings and community centres). These centres have traditionally offered services to a single group within the community. Recently, there has been a shift to offering multiple services to multiple groups at different times and in different spaces within the centre.

- *Egypt* provides one example of this type of civic telecentre. The Investing in Egypt's Future initiative, launched by the First Lady, Her Excellency Mrs. Susanne Mubark in 1997, focused on developing ICT-empowered libraries. The telecentres follow a business model that was structured to ensure sustainability. They are wired locally and internationally and have two permanent staff who are computer literate. Each centre has a number of PCs as well as a software library and training programmes (Ramzy, 1999).
- In the *U.S.A.*, the Community Technology Centers Network (CTCNet – www.ctcnet.org) has assisted in establishing hundreds of telecentres in low-income urban and rural areas (Murray, Murray and Brooks, 2001). CTCNet brings together agencies and programmes that provide opportunities where people of all ages who lack access to technologies can use them to develop personal skills and self-confidence. The majority of these centres' clients have used them to improve their skills, mainly in computer-related areas, and to find jobs. These organisations support lifelong learning opportunities, especially for people who have had limited and/or negative educational opportunities. Some of these centres are standalone while others operate as part of larger organisations such as museums, libraries, job training centres and shelters. These centres often offer limited services and do not publicise their services outside of the immediate community. Connectivity usually depends on a single dial-up connection, although in some cases there are sophisticated local area networks and dedicated lines.
- In *Mexico*, using electronic media (mainly television) as a pedagogical tool for both basic and adult education was started in 1968 with the development of telesecondary school (see www.embamexcan.com/english/indexenglish.html). The telesecondary school uses a channel from EDUSAT, Mexico's Education Network via Satellite. The EDUSAT signal covers all 32 federal entities and is received in Central America and the southern United States. Each classroom is installed with receiving equipment (an external satellite dish for the school, a decoder for the classroom, and a 27-inch screen television set) that is used primarily for programmes for grades 7, 8 and 9 in junior high school. This service is increasingly being used to support civic and other non-formal education activities.

Cyber cafés

The cyber café model is one that needs further exploration as most are based on a for-profit basis. However, the rapid growth and popularity of cyber cafés, especially in urban areas, is worth noting and exploring ways for their use to support access to virtual education opportunities. Some community-oriented cyber cafés offer preferential rates or services to communities or local organisations while still maintaining their commercial business activities to the general public.

An example of using a cyber café was recently illustrated by Niall McKay (2001) in which he focused on the computer science courses being offered by the Carnegie Mellon University. The courses are being offered worldwide, and in India the point of access is the Internet cafés in Delhi. To offer support to the students, Carnegie Technology Education, a subsidiary of the university, has partnered with Sterling InfoTech, an Indian Internet service provider, and local cyber cafés.

As well, the Senegal government, with the support of a Senegalese private company, has agreed to establish cyber cafés in the Universities of Dakar and Saint-Louis, as well as in public schools. (Pan African News Agency, 2000). The Cheikh Anta Diop University in Dakar will have a cyber café of 100 machines while the University of Gaston Berger of Saint-Louis will have between 40 and 50 machines. Students will access these cyber cafés after paying a one-year user fee of between CFA2500 and 5000 francs. There will also be a surfing fee. Details of this initiative can be found on the Web site: www.allAfrica.com.

Multi-purpose community telecentres

Multi-purpose community telecentres (MCTs) offer more than basic access to ICT. They "are likely to have higher-end technologies, employ full-time staff, focus on specialised services and train a broad array of users in areas such as health, education, small business and local governance" (Norton, et al., 2000). Often these centres also offer postal and banking services, and given the high bandwidth requirements of the MCT, most have leased lines or ISDN (integrated services digital network) with a local network connecting the computers. Increasingly these centres are being used for tele-trading, support to small and medium enterprises and vocational training courses.

- In *Brazil*, the pioneers of the MCT "sought to open telecentres based on a multi-purpose model comprised of public service module, tele-office module, business module and educational module" (Murray et al.). The educational module in this case study proved the most important to the success of the centre as it offered the application of technology to support formal education, training and small business development. It also enabled access to distance education courses and influenced formal education teaching by making resources and training available to teachers.
- *The Australian Telecentre Network* (Queensland Open Learning Network, Tasmanian Online Access Centers, Gippsland Centers Network and Western Australia Telecentre Network) was established to enable access to tertiary-level students that were in rural and remote communities. Thus these centres serve as venues through which educational institutions can offer courses and programmes.
- *The Ministry of Education and Training in Vietnam* recently announced that it is building two national distance education centres in Hanoi and Ho Chi Minh City and a regional centre in Hue. These centres, together with the upgraded provincial satellite centres, will provide distance education throughout the country. The centres will be equipped with modern facilities and all computers will be

connected to the national computer system. The initial users of the centres will be teachers, with a needs assessment being done to gauge training demands from other economic sectors and other uses for the centres (Son, 2000).

- In *India*, the MS Swaminathan Research Foundation has partnered with the International Development Research Centre (IDRC) to implement the Information Villages Research Project in the Pondicherry region (see www.mssrf.org). This project is based on the argument that providing information and adding value to such information is vital to enabling rural families to access it. The project has established value-added centres where staff scans the Internet for information on technologies, health, transport, public events, education, subsidies, prices of local commodities, etc. Thus the value-added centre acts as the hub site and uses VHF radio system for a local area network that connects the hub to village information centres (information shops).

  Each shop varies in the way it is operated and supported. One has a village development council; another has a non-formal trust established by the community; a third uses space allocated to it by the locally elected *panchayat.* The shops each have a pentium PC with multimedia software and printers. The PC is connected to the wireless network through a modem. Each shop also has a board to display bulletins and other village information. Given the range of information available via the hub site, various members of the village use the shop for different purposes.

Other examples of such centres can be found in Benin, Mali, Mozambique, South Africa, Tanzania, Uganda, Honduras, Suriname, Bhutan, Pakistan and Philippines.

TECHNOLOGY NEEDED FOR TELECENTRES

Jensen and Walker (2001) have noted the technology options and requirements for developing telecentres.

- A key technology is telephony services. A telephone system is a vital part of telecentres. Phones need to include audio-conferencing facilities, answering machines and a call accounting system that can note the unit charge of the calls made and, therefore, calculate the costs of the call. Faxes are also important to communications, and telecentres are increasingly able to make use of low-cost Internet-based fax services.
- Computer systems lie at the heart of the telecentre development. The majority of centres have a multi-PC environment with one machine dedicated to administration with the others being available to the general public. Increasingly, many telecentres are using refurbished computers to add to their network.
- Internet access is increasingly becoming the selling point for telecentres. If telephone linkages are unavailable, then standalone computers, TVs and radios are able to provide services to the community. Internet access via dial-up to an Internet service provider (ISP) is often expensive, especially when it requires a long distance call. Therefore many telecentres tend to focus more on e-mail access than Web access.
- When more than one PC is being used, they can be linked together via cables into a local area network (LAN). Wireless LANs are becoming popular as they allow for expanding the networks to other buildings without the need for cabling.
- Some centres also have community radio stations that offer valuable information and

support to education, health and community development.

Other technology requirements include printers, modems, video-conferencing and various software for training, education and communications. Other equipment generally found in better resourced telecentres include photocopiers, binding machines, CD writers, scanners, laminators, paper shredders, cameras, VCRs, audio cassettes, and projection equipment.

Driving and Constraining Forces of Learning Venues

DRIVING FORCES

Clearly the need for education and training is the main driving force for the development of innovative learning venues. As noted earlier, there has been a massive increase in the number of students enrolled in various sectors of the education and training system. There has also been increasing demand for professional development opportunities that has resulted in the rapid increase in the number of private sector providers using technology to deliver education and training. This growth, coupled with the developments in ICT, has resulted in learning being accessed in creative ways.

The concern to bridge the digital and information divide is also an important driving force in the development of innovative learning venues. This is best illustrated by the recent meeting of the world's richest nations at their G8 conference in Okinawa, Japan. The Japanese prime minister announced that Japan is committing U.S.$12 billion in loans and U.S.$3 billion in grants over the next five years to ICT technology initiatives in the developing world. This announcement was coupled with a set of proposals constructed by a task force established at the 2000 Davos meeting that called for, among other things, the creation of a Peace Corps-style group called the Global Digital Opportunity Corps and the establishment of local technology community centres (News Update, Jan. 2001).

With the drive for learning comes the need for individually tailored education that notes a person's capability, potential and level of maturity in terms of his or her own learning progress. This need for individually tailored education has been helped by the development of resource-based learning, distance education and, more recently, the creation of learning objects for content aggregation. Enabling the individual learner to access education opportunities using ICT has ensured that there is an emerging market for education. This in turn has driven the development of innovative access points to learning opportunities.

Access is not only about hardware and software; it is about creating an environment which attracts students by providing them with a place to meet their peers and teachers/tutors and with access to resources necessary to complete their courses (OECD Report, 1994). The need for more physical space in the form of traditional classrooms is often resisted in developing countries because of the cost. The notion of multi-purpose learning centres offers a more cost-effective use of such physical infrastructure. As Bester (2001) has written, a further driving force supporting the development of multi-purpose learning centres is the potential to cater to "diverse and varied community education needs over the wider age continuum…these centres have the potential of offering programmes directed at preparing learners for the world of life and work beyond school, and more specifically, to become competent citizens in the information age and knowledge society." Simply, these centres are able to be flexible and respond to changing demands for different learning options.

Multi-purpose centres also allow learners to work on their courses at a time and place convenient to them (assuming the centres are in close proximity and are open for long hours). This flexibility allows students to engage with tutors and course developers via e-mail rather than having to wait for a time and place in a traditional space of the lecture or tutorial room. It also allows the students more opportunities for peer engagement.

CONSTRAINING FORCES

The strength of being able to access learning at all times can also act as a constraining force. By increasing access to the technology, greater demands are placed on the time of the tutor or instructor. These demands are for quick responses to queries, assignments and other work for assessment, for keeping the Web site updated and for electronic discussions. This requires proper planning, both for the network that is being used to engage with students and with the response time for feedback to students.

There are a variety of other constraining forces that hinder the development of innovative learning spaces:

- Access to connectivity remains one of the major challenges facing many developing countries. Darkwa and Mazibuko (2000) correctly note that:

  > students would need access to computers that can send and receive messages using Web browsers such as Explorer or Netscape. In addition, they would have to find on their computers word processors and other applications to complete basic assignments. Easy and inexpensive connections to Internet service providers would be required. In addition, depending on the nature of the given course, students might be required to use a VCR to play videotaped instruction and perhaps tape recorded lectures. Textbooks and other printed materials would still be part of the curriculum. All of these basics require funds which many individuals and institutions simply do not have.

- The issue of costs is also a hindrance to developing learning spaces. Governments in many developing countries have stopped building schools and classrooms on any meaningful scale. It is left to donor agencies and the private sector to consider building classrooms. The costs associated with using ICT are also prohibitive in many developing countries. While the unit costs of hardware and software are being lowered in terms of the U.S. dollar, the worsening exchange rate of developing countries means that there is no appreciable drop in the costs.
- The successful use of multi-purpose centres for virtual education relies on trained and professional support. Often learners require support, whether online or at the centres where they access the learning materials. This support, however, is often lacking in developing countries where, to date, very few scholars are familiar with teaching and support in an online environment. This situation poses a threat to being able to deliver online learning as well as to the development of online courses that are context-specific to a country or region.
- A further concern is about the quality of the degrees being earned online. The American Federation of Teachers, which represents more than one million teachers, does not believe that "an online degree equals the same degree as one where someone is meeting with other students and professors" (Wilfong, 2000). This opinion illustrates the need for trained and professional support at the access points to ensure that the quality of support for online degrees and other courses increases the quality of those degrees and courses.

Major Considerations for the Development of Learning Venues

Having noted the poor levels of connectivity in many developing countries and the development of multi-purpose telecentres as one strategy to promote the use of ICT for general and educational applications, one needs to consider the key issues in the development of learning venues to support virtual education. The four major considerations that need to be addressed if learning venues are to support virtual education are planning, management, education application and learner support.

PLANNING

The establishment of multi-purpose centres requires careful planning that needs to involve the major role-players in the community. Such planning should focus on the aims and objectives of the centre in terms of the services it wishes to provide. To plan effectively, it is necessary to conduct an internal and external environmental scan.

The internal scan should focus on internal practices to identify the strengths and weaknesses of the centre and the technological infrastructure required. The external scan should note the various factors that would support or hinder the centre. Some of these would include possible partners in terms of content, technical support and education institutions; organised user or client groups within the community; government (local, regional and national); local businesses and the recreational needs of the surrounding community. This scan is crucial to determine the programmes that could be offered, to ensure that the centre is able to meet the needs being expressed by the community it is serving and to enable it to become economically self-sustaining.

The last issue, sustainability, is vital. Often these centres have been established by government departments, private sector organisations, development agencies, non-governmental organisations or a combination of these entities. A centre's ability to become self-sustaining over a period of time depends on the services they offered and whether education is one of major services.

A number of key issues have an impact on sustainability and need to be factored into the planning process. The following is a summary of some of the key issues that have been identified by Norton, et al. (2000).

- Clearly there needs to be a combination of local ownership and management with external investment. The franchised-based model for the multi-purpose centre offers the best option to enable sustainability. It allows for outside seed money, bulk services and rates, training, equipment and technical assistance to be provided to the centre.
- The centre needs to be located in an area that has a relatively dense population with a strong small and micro-enterprise (SME) platform to enable it to be sustainable. If such centres are linked to existing institutions of good standing within the community, then the chances of being successful and sustained are greater.
- The centre must meet real needs and develop specific content for local communities. The need for relevant, accurate information that can be applied to different sectors (education, health, small business, agriculture, community development) ensures that the users identify with the centre and the relevance of the services being offered. This approach displays a demand-driven list of services that meet needs.
- The quality and commitment of the management and staff is vital. Training of a technical nature, personnel, financial and marketing is necessary to the success of the centre. A centre that offers a broader range

of fee-for-use services to the local community is likely to generate revenue that could be used to cross-subsidise other services that are not revenue-generating.

- While there is great value to offering a wide range of services and functions, this approach can also lead to the centre management and staff not having the skills and being unable to cope with the strategic planning and management required.

MANAGEMENT

Elmer (quoted in Murray, Murray and Brooks, 2001) notes that "the community-based telecentre model under experimentation in a number of developing countries may well represent a new organisational form for delivering quality educational services on a more equitable and cost-effective basis." Given the experimental nature of telecentres, their success is based on good management that interprets the mission, aims and objectives into deliverable programmes, projects and services that meet the needs and priorities of the clients and community. In this context, managing the planning process, staffing structure, recruitment and responsibility, financial management, quality assurance of the services being offered, administration and governance of the centre are important management issues.

Managing any centre should also include external components that include advocacy in terms of stating what the centre offers, providing information to client groups, marketing the services, assessing new needs of the various client groups and facilitating collaborative relationships with various institutions, both public and private, non-governmental and community-based organisations.

The manager and staff need to understand the above requirements for a successful centre. All staff members should be able to clearly articulate the focus of the centre and display a high degree of skills and attitude that meets the needs of the client group and encourages them to visit the centre and use its facilities.

Murray, Murray and Brooks (2001) suggest that computer skills, together with strong management skills, are necessary prerequisites to making a telecentre work. Thus, training is a vital part for the development of any centre and should include management and other necessary skills. They list the following as possible key training components:

- Communication and development.
- The role of telecentres in development.
- The role of the telecentre manager.
- Business and financial skills.
- Needs assessment skills and evaluation (research) methods.
- Training skills.
- Human resource management.
- Marketing and public relations skills.
- Communication and development.
- Basic computer skills.
- Information production skills (Murray et al., 2001).

There are already a variety of course materials available in these areas for training.

EDUCATION APPLICATION

In many ways, predicting the nature of the learning venue that is designed to support a single mode of learning will render such a building obsolete. Such learning venues need to consciously cater to multiple technologies and different learning styles if they are to be successful and inspirational.

The physical nature of learning venues is likely to be an issue to accessing virtual education. While noting the changes in technological and educational trends, the question of "whether the concept of a school as a single-use building occupied for only part of the day by an age-defined group of people" will not be entertained (OECD Report, 1994). It is clear that given the economic pressures, access pressures, the changing nature of the learning and teaching process and the developments in the technology, there will be a multiplicity of uses across different age groups and different types of education needs will be met.

In determining such venues for a multiplicity of uses, it is important to ensure that all learning forms are catered to, including individual learning using different technologies as well as space to encourage collaborative work. The main technologies need to include telecommunications, computers (most likely to be data networks), electrical power from different sources (gas, solar, hydro) and broadcasting (radio and TV).

Understanding the educational applications within the physical learning venue is important. One of the most obvious strengths of the technology is its ability to offer up-to-date resources and information to a large number of learners, teachers and administrators immediately, easily and relatively cheaply. Using Internet technologies, the following applications become possible:

- "Supporting the use of resources that combine more than one medium, namely multimedia resources, which combines video, audio, graphics and text, and have the potential of providing rich learning experiences" (Bester, 2001).
- "Bringing designers of online learning resources in contact with the huge resources base that resides on the World Wide Web. This in itself is said to be of negligible educational value, but if harnessed effectively by educators, could become a useful resource" (Bester, 2001).
- Supporting a range of communication strategies between the learner and teacher, between learners and between teachers. Such communication could be asynchronous or synchronous.
- Ensuring that the technology supports and creates efficient management and administration systems within the education system.

LEARNER SUPPORT

Perraton (2000) notes that one feature of using technology for education and training is student support services of various kinds. This requirement has both organisational and costs implications and is often labour intensive, even when using different technologies. It follows that learner support is an important consideration when implementing virtual education interventions. Several types of support should be made available to learners. Bester (2001) notes four types:

- Support of all kinds on a regular basis offered by educators both through face-to-face contact and other forms of communication (including telephones, the post and computer links).
- Interaction between learners on both a group and on a one-to-one basis.
- Provision of any necessary learner support in educational courses.
- Provision of access to the necessary facilities, including a space in which learning activities and interaction between learners can take place, as well as access to computers, laboratories and other resources that might be necessary within the learning process.

A fifth type of support necessary for centres to consider when supporting virtual education is easy access to administration procedures that are necessary when registering and paying for courses and when needing to enquire on matters.

Conclusion

The rapid development of virtual education has brought to the fore different challenges to the provision of education and training. The delivery of virtual education, that is the provision of an educational transaction for a formal certificate or for non-formal purposes, has shown tremendous growth and is likely to increase as the demand for education and training grows.

However, this growth and projected increased demand has been and is likely to be uneven with the developed world being able to fully exploit the advantages of virtual education. The developing world, with its difficulties in education systems, education processes and practices, infrastructure, telecommunications infrastructure, lack of ICT infrastructure, etc. will constantly find itself at the lower end of usage of virtual education.

To encourage access, the development of innovative learning centres (community learning centres, telecentres, multi-purpose community learning centres) has been occurring. Such developments have been experimental in nature and driven in large part by development agencies and the private sector. These centres face crucial challenges in terms of their sustainability, their effective management and meeting their target group's needs.

Despite these challenges, such centres offer access to learners of various virtual education opportunities. The development of these centres need to be encouraged and supported if they are to be effective in ensuring that more learners are able to take advantage of virtual education opportunities.

The development of a learning/multi-purpose centre requires certain issues to be addressed and structures to be in place:

- The physical location of the centre needs to be in a community to enable easy access for users.
- The start-up process must ensure that there is a clear understanding of what the centre is going to do and the needs that it will be meeting.
- The mission must be clear and focus on identified needs that are being expressed by the various user groups within the community.
- The structure of the centre in terms of its organisational requirements (including staff, management structures and procedures, financial systems, etc.) and infrastructure (including the appropriate ICT) must meet the varied needs of the community.
- Community support must be achieved through a mixture of assessing needs, marketing the services and functions, working with community structures and involving such structures in the governance of the centre.
- Appropriate links and partnerships with different service providers must be created. These should include education and training institutions, various NGOs, small and micro enterprises, all levels of government, etc.
- Needed services and functions must be delivered. Such services and functions need to meet the needs of the community being served as well as the internal needs of the centre. (Internal needs include management training, financial and resource management, evaluation and ongoing needs assessment.)

However, such centres should not be seen as the only means to enabling access to virtual education and training. Clearly these centres need to be encouraged as part of a series of strategies that encourage learners to access virtual education, including learning in the home, work place and elsewhere. The need for economic growth and community development is vital so that poorer people and learners have the means to participate in virtual education courses and programmes.

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WEB RESOURCES

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www.embamexcan.com/english/indexenglish.html — The home page for the Embassy of Mexico in Canada. Link to the education menu for information on the telesecondary schools.

www.kabissa.org — A site for African non-profit organisations to use the Internet to strengthen capacity and build civil society and democracy in Africa.

www.mssrf.org — The site for MS Swaminathan Research Foundation which is committed to harnessing science and technology for environmentally sustainable and socially equitable development.

www.worldbank.org/gdln/dlcs.htm — The Global Distance Learning Network is designed to bring decision-makers in the developing world together into a global network of peers, experts and practitioners to share ideas, experiences and expertise using an interactive multi-channel network.

www.iicd.org/models/telecentres/index.html — Information on telecentres from the International Institute for Communication and Development (IICD).

3

The Continuing Evolution of ICT Capacity: The Implications for Education

DR. TONY BATES

Introduction: General Trends in ICT Capacity

The capacity for information and communications technology (ICT) has been growing exponentially over the last 10 to 15 years. Computers have become more powerful; satellite, fibre optic and wireless technology has increased transmission capacity; and software developments such as multimedia authoring systems have made it easier to create digital materials such as electronic games, computer simulations and educational materials.

The increased capacity and supply has resulted in plunging prices for computer functionality, telephone services and software. Nowhere has the impact been greater than on the telephone industry. Long distance charges in North America and between major developed countries have dropped by 90% in the last 15 years. Some analysts believe that the Internet will transform the pricing structure for telecommunications from charges by distance and time to a flat charge by capacity. Thus a client will pay according to the size of the "pipe," not by the distance or length of time for which it is used. It should be noted that while the growth of the Internet is one of the major drivers for change, it is only one of several different but converging technologies that are resulting in widespread capacity growth.

The rapid growth in satellite and wireless technology, and in particular the growth in mobile phone technology, is resulting in some countries attempting to leap beyond previous or intermediate technologies. For instance, telephone capacity in China had been limited by lack of hard-wired networks. Mobile phone technology is allowing for a rapid expansion of telephone access in China. It is the last link to the end-user that has previously made hard-wired networks expensive to install on a widespread basis. Wireless technology avoids the need for hard-wired circuits into homes and offices.

However, there are several conditions surrounding this rapid growth in ICT, which can be summarised as follows:

- Despite the recent adjustments to world stock markets, capacity in ICT is forecast to continue to grow rapidly. For instance, while both Cisco and Nortel, the main providers of network hardware for the Internet, have revised downwards their growth forecasts this year (2001), both anticipate continued growth of 15% or more annually for the next five years. This suggests that access, bandwidth and applications will all continue to increase into the foreseeable future.
- The technical capacity has far exceeded the capacity of governments, commercial

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organisations and educational communities to respond fully to the opportunities and challenges this rapid change has brought.

- ICT growth is not equal between different countries, between different socio-economic groups within countries or within different economic and social sectors of society. This inequality is often referred to as the digital divide: the gap between those with access and with the skills to use ICT appropriately, and those who do not have this capacity.
- Free trade and lower labour costs in developing countries in manufacturing and in resource-based industries such as agriculture and forestry have forced many former industrial nations, as well as some newly emerging "economic tigers" such as Malaysia and India, to move more aggressively into knowledge-based businesses heavily dependent on ICT technologies. Thus there has been a rapid growth in e-commerce, software development, hi-tech design (such as micro-processors, digital routers, computers and digital telephone switches), entertainment (video and computer games, film and television) and financial industries in developed countries. Such knowledge-based businesses both exploit the advantage of a highly educated workforce and, at the same time, drive the demand for an even *more* highly educated workforce. Much of this growth has occurred in smaller, more dynamic companies that avoid hierarchical management structures. The development of alternative organisational and management structures for the new knowledge-based industries is also relevant to virtual education, which is not only dependent on an extensive and reliable ICT infrastructure, but also requires a post-industrial approach to organisation and management.
- Technologies such as wireless and the Internet are disruptive in the sense that they bring about radical change to previously stable sectors. Companies such as Apple, Netscape, and amazon.com have helped revolutionise certain industry sectors, forcing previously dominant corporations either to radically change their operations or to close down. These same forces have the potential to bring about similar changes in the education sector.

Given the impact of ICT on many businesses and industries, it is not surprising that many commentators have seen education as being potentially revolutionised by it. Hence, there is great interest in virtual education, which is based on the idea of a widespread and significant application of ICT to the core activities of education.

However, despite a great deal of hyperbole about the potential of ICT for education, real growth and change has been slow and marginal. This is due not only to lack of vision or commitment by educators and policy-makers; there are significant structural and cultural barriers or restrictions that have slowed the potential for change in education compared with other sectors.

These issues are discussed below, first looking at some case studies, then examining what kinds of technology are being used and why. Following that is a brief examination of some key emerging technologies and how they may have an impact on the education sector.

Brief Case Studies of Major ICT Applications in Education and Training

As there is a very wide range of different applications of ICT in education, any choice of case studies is somewhat arbitrary. For example, the Open University in the U.K. (UKOU) has been using communications technologies such as broadcast television and radio for educational delivery since the early 1970s, and in recent years it has also moved into online programming.

However, print still remains the core delivery medium for the UKOU, even though it has expanded its programming into Europe and other areas of the world.

Similar "dedicated" national open universities, such as Indira Ghandi National Open University in India, the Chinese Central and State Radio and Television Universities, and the Korean National Open University, have operated for many years, primarily on a mix of broadcasting and printed materials. Other dedicated open universities, such as Athabasca University in Canada, have moved more aggressively into Web-based delivery.

At the same time, many institutions that offer both campus-based and distance programmes, such as the University of British Columbia (UBC) in Canada, Charles Sturt University in Australia, and Penn State University in the U.S.A., have begun to move their former print-based distance education courses online. For instance, UBC has over half of its 110 distance courses now online. In Korea and several other countries, campus-based universities are forming consortia for the delivery of online distance learning programmes.

However, the most dramatic change in the use of ICT has not been in the traditional distance education market. The biggest impact has been on campus-based teaching and in the private sector training market. John Chambers, the CEO of Cisco, one of the world's largest ICT companies, has stated that "the next big killer application for the Internet is going to be education" (Moe and Blodget, 2000). Merrill Lynch has described e-learning (the combination of the corporate learning and higher education markets) as a U.S.$18 billion market by 2003, compared with $2.3 billion market in 2000 (Moe and Blodget, 2000). Here are just a few examples:

- WebCT, a course authoring software platform, has over three million student licences in over 1500 institutions, and it is growing at a rate faster than 500,000 new student licences a year. However, WebCT estimates that over 80% of the use of its software is to support classroom teaching rather than "pure" distance education. Thus we are seeing the emergence of "mixed mode" teaching, combining face-to-face instruction with online learning. One of the best examples of this is the University of Central Florida, which has an extensive programme of Web-based courses available both to on-campus and off-campus students (see www.distrib.ucf.edu/present/FETCpresentation030100/index.htm for details of its online course strategy).
- A number of universities have formed consortia and partnerships with the private sector to commercially exploit their e-learning initiatives. Universitas 21 is a network of 17 universities in mainly Commonwealth countries, including Nottingham University, University of Edinburgh, University of Melbourne, Hong Kong University, National University of Singapore and the University of British Columbia. Thomson Publishing and Universitas 21 have announced a partnership to found an "e-university." In 1990 there were 48 million people in higher education (Moe and Blodget, 2000); by 2025, Thomson Publishing estimates that there will be 160 million.
- UNext, a U.S. company, has established an e-university called Cardean (www.cardean.com/cgi-bin/cardean1/view/public_home.jsp) that adapts its teaching material from that of the universities of Columbia, Stanford, Chicago, Carnegie Mellon and the London School of Economics. Degrees are awarded under the Cardean name, endorsed by the state of Illinois.
- The London School of Economics (LSE) is also more deeply involved in an e-learning venture called Fathom (www.fathom.com), launched last year as a global online library linking institutions such as the New York Public

Library, the British Library, the Smithsonian, the Cambridge University Press and the LSE. Fathom's partners participate in the running of the service, and all must approve materials before they are published on the site.

- The U.K. government has established one of the most ambitious joint e-university projects. It has put the Higher Education Funding Council for England (HEFCE) in charge of attempts to create an e-university with a budget of £400 million, half of which will be public sector money. At first this was intended to be an exclusive arrangement, with universities bidding to become members. But now all U.K. universities are allowed to hold shares. The only human contact in the core programme will be with "navigators" — advisers who will help new students to select courses. Only those students who attend summer schools or pay for additional tutorial support will receive face-to-face tuition.
- Oxford University is linking with Stanford, Yale and Princeton to create an online college for alumni. The idea is to provide lifelong learning and support to some of the world's policy-makers and business leaders. Cambridge is exploring virtual learning in its £83 million government-backed link-up with the Massachusetts Institute of Technology (MIT). The project is known as the "bridge of minds" and is principally intended to foster commercial spin-offs from university research. It also has potential to become an e-university.
- A U.S. company, Hungry Minds (www.hungrymindsuniversity.com), has contracted with Michigan State University, New York University, Penn State University, Rochester Institute of Technology, University of California Berkeley Extension and University of California at Los Angeles Extension to provide a range of e-learning services. These vary from providing a common Web portal for their courses, to supporting the development of online certificates by these institutions.
- Since 1996, the University of British Columbia (UBC) has been offering a fully online graduate level programme on technology-based distributed learning in partnership with the Monterrey Institute of Technology in Mexico (http://itesm.cstudies.ubc.ca). The core of the programme is on the Web, but UBC also participates by video-conference link from Vancouver to Monterrey in satellite television broadcasts to Monterrey Tech's 29 campuses across Latin America. Monterrey incorporates the five courses in its own master's degree in Educational Technology and has the rights to offer the five courses throughout Latin America. UBC has made the five courses available to both its own mainly campus-based master's students as well as to the rest of the world as a post-graduate certificate programme. To date, it has recruited students from more than 30 different countries. This programme runs on a self-financing basis entirely from student fees. As a result of this experiment, UBC and Monterrey plan to offer a joint master's degree in educational technology in both Spanish and English on a global basis from January 2002.

In the private sector training area, there has been a rapid expansion of "corporate universities," primarily in-house training organisations in the larger multinational companies making use of video-conferencing and the Internet. In parallel, there has been the development of a whole new industry of online training contractors who provide online training services to medium- and smaller-sized companies. Almost two-thirds of Merrill Lynch's estimated $18 billion market is in this private sector training area.

A number of private, for-profit organisations are trying to bridge the gap between centralised distribution (such as foreign Web courses or satellite TV) and local support. For instance, TeltecGlobal (www.teltecglobal.com) is a "business services aggregator" offering corporations and governments "a one-stop, turn-key solution for access to 21st century technology, services and education." The TeltecGlobal Center of Influence is a "last mile" strategy that provides customers with products and Web-enabled services available through membership in their Community and Business Centers located in developing countries. TeltecGlobal Community Centers work in conjunction with multinational corporate sponsors, designing an offering of products and services "to meet both community needs and corporate objectives." Business Centers license operations to local entrepreneurs and "global government-backed entities" in emerging markets. As with the Community Centers, TeltecGlobal works with the licensees to tailor the products and services to market needs and licensees' goals. TeletecGlobal is a good example of the increasing synergy between technology, education and business.

These developments are not so different from the chaotic, diverse and excessively optimistic developments in the dot.com business sector. Indeed, especially in the U.S.A., e-learning is seen as just another branch of e-business. However, a more careful analysis of these developments will indicate that there are many barriers and challenges that need to be overcome before such initiatives can operate on a sustainable basis.

What Kinds of Technology Are Being Used?

WORLD WIDE WEB

The predominant technology being used for e-learning in the developed world is the World Wide Web, which in turn relies on the Internet. At the end of 1999, more than 196 million people globally were using the Internet; by the end of 2004, the number is expected to rise to 638 million (Moe and Blodget, 2000).

There are many reasons for the rapid application of the Web in education:

- Through the use of browsers and a relatively simple programming language (HTML), the Web provides universal standards and interoperability between different machines and operating systems, which allows for global reach and access.
- The Web can be transmitted both through already-existing infrastructure, such as analogue telecommunications networks, as well as through high-speed digital networks, giving it a wide range of technical flexibility.
- The Web is a low-cost technology for education for several reasons:
    - There is a relatively low cost of entry for educational suppliers. The cost of the technology needed for online courses (such as a server and course authoring software) is marginal compared with already-existing infrastructure costs for business and administrative purposes (computers, communications network, etc.).
    - Development of materials is relatively low cost because of a simple computing language (HTML) for creating materials and the development of intermediary course authoring software (such as WebCT and Blackboard) that enables Web sites to be easily constructed.
    - Through its use of the Internet, there is no direct charge for independent packets of information (as is the case with voice telephone calls); pricing is by volume (the size of the pipe into the institution), not by time or distance. Since most current applications use narrow bandwidths, the transmission costs per course for the supplier are virtually zero.

- The Web's ability to combine text, graphics and a limited amount of multimedia gives it a wide range of applications in education.
- The Web enables free and global access to a very wide range of high quality (as well as low quality) learning resources located on Web sites.
- The Web offers opportunities for international, cross-cultural and collaborative learning.
- The Web enables learners to study at any time and, increasingly, from any place.
- The Web allows asynchronous (time-delayed) interpersonal communication, not just between instructor and student, but more importantly, between learners and other learners, through e-mail, bulletin boards and online discussion forums.

This last point cannot be stressed too strongly. The ability to enable students to communicate with each other independent of time and distance moves distance education away from a transmissive, teacher-dominated model of education to a more interactive form of learning where students can adapt and apply learning to their own needs. In a knowledge-based society where information and knowledge are rapidly increasing, it is essential for students to be able to question, discuss and analyse their learning in a social context.

However, there are several constraints that limit even greater expansion of the Web as a learning technology, particularly in developing countries:

- In many developing countries, and in a small but significant number of communities and homes in developed countries, the necessary minimal technology infrastructure needed to support the Web — a computer and a telephone — simply do not exist.
- Even where the minimal infrastructure is in place, many people do not have the necessary computer, keyboarding and literacy skills to make effective use of the Web.
- Most applications of the Web still have to fit into narrow bandwidths, limiting educational materials to text and static graphics.
- To fully exploit the educational advantages of the Web, teachers need to adapt and change their teaching methods. Without adequate support and instruction, teachers will merely add cost to the current system by bolting on the technology to traditional classroom methods.
- Teachers also need technical support, both in terms of ensuring the networks, software and equipment work properly and are adequately maintained, but also in the design and development of Web sites. This requirement adds substantially to costs.
- The interactive, participatory form of learning that has developed around the use of the Web is culturally unsuited to the predominant mode of teaching and learning in traditional societies, which give great respect to the teacher, and where students are not expected to question the wisdom of elders.
- To justify the expense and stress of major changes in work methods, Web-based learning needs to be used strategically and be adequately resourced. However, many administrations lack both the vision to use it for strategic change and the willingness to reallocate sufficient resources to ensure success.

SATELLITE BROADCASTING

Another technology that is being used extensively in education is satellite broadcasting. Satellite television for educational purposes has a long history dating back to the early 1980s. India was one of the first countries to use satellite television through the INSAT project, and today Indira Ghandi National Open University is still a major satellite user. The Chinese Central Radio and Television University is another major user, with over

800,000 students. Monterrey Tech in Mexico (www.itesm.mx) has four satellite TV channels operating 24 hours a day, seven days a week, covering large parts of Latin America. It is used primarily to deliver lectures from its headquarters in Monterrey, and it provides two-way communication through e-mail questions from students to the studio host in Monterrey.

In North America, satellite transmission has become more and more integrated into a broader range of communications technologies, combining television, telephony and data transmission. There, satellite TV is now mainly used for educational purposes to cover relatively sparsely populated areas (e.g., The Knowledge Network in British Columbia), or for special educational events, such as forums on topics of interest with highly respected speakers. It is rarely used as the main technology for formal education courses, although the National Technological University (www.ntu.edu) in the U.S.A. uses satellite TV to provide graduate engineering and business courses to corporations.

One satellite application of particular relevance to poor developing countries is WorldSpace (www.worldspace.com). Headquartered in Washington, D.C., the WorldSpace business was founded in 1990 to provide direct satellite delivery of digital audio communications to the three-quarters of the world population that lacks radio reception and programme choice. New digital technology combines low-cost radios with direct satellite reception using small, portable satellite receivers developed specially for the project by some of the world's leading electronic companies (e.g., Hitachi, JVC, Panasonic and Sanyo). WorldSpace obtains programmes from regular broadcasters such as the BBC. It started operations in Africa but has recently extended its services to Asia. Its potential audience is now approximately three billion.

The African Virtual University (AVU), initially developed by the World Bank, is another initiative using satellite television broadcasting (www.worldbank.org/knowledgebank/facts/avu.html). AVU uses ICT to give the countries of sub-Saharan Africa direct access to high-quality academic faculty and learning resources in Africa and throughout the world. Professors from universities around the globe deliver classes in a studio classroom. The course is then beamed by satellite to AVU's learning centres all across Africa, each of which is equipped with an inexpensive satellite dish to receive the signal. During the class, students have an opportunity for real-time interaction with the instructor using phone lines or e-mail. At each participating AVU learning centre, on-site moderators guide the students through the materials and act as liaison with course instructors. All learning centres are equipped with Internet access and at least 50 computers.

Since the launch of its pilot phase in 1997, AVU has provided students and professionals in 15 African countries with more than 2500 hours of interactive instruction in English and French. More than 12,000 students have completed semester-long courses in engineering and the sciences, and more than 2500 professionals have attended executive and professional management seminars on topics such as Y2K, e-commerce, entrepreneurship, and strategy and innovation. AVU also provides students access to an online digital library with more than 1000 full-text journals. More than 10,000 students and faculty have opened free e-mail accounts on the AVU Web site. It has established itself as an independent, non-profit organisation headquartered in Nairobi, Kenya. During the next three years, AVU will expand to more countries in Africa and reach undergraduate students, faculty and professionals through three main avenues: learning centres in universities, private franchises and professional learning centres housed in corporations and non-governmental organisations.

Satellite broadcasting has the following features relevant to education:

- Because of the relatively high infrastructure costs (studios, satellite transmission and receive sites), it has high fixed costs but very low variable costs; this makes it most effective when many students (usually numbered in thousands) can receive a single programme.
- It provides a common standard of lecture or teaching to all students, wherever they may be located.
- It fits a transmissive model of education, where students are expected to remember and understand what is being taught.

Satellite broadcasting suffers however from the following constraints:

- It requires very high start-up costs and a high level of technical expertise to launch and maintain.
- Despite the use of alternative technologies for two-way communications such as telephone and e-mail and the use of local teacher-supported discussion groups, it is difficult to make satellite broadcasting very interactive for learners.
- Learners with Internet access have less flexibility in terms of time and place of study from satellite broadcasting than from studying through the Web, being tied either to the time of the broadcast or to a fixed location if they do not have personal access to satellite reception equipment.
- The need to provide convenient, secure and accessible local reception sites can add substantially to the cost, especially for satellite TV.
- Satellite TV lacks the educational flexibility and the future potential for improvement that can be found in the Web.
- Governments appear to be less willing to regulate and fund educational satellite TV initiatives, partly because of the high cost, and partly because of a move to more deregulated communications policies. In such a context educational users are usually unable or unwilling to pay full commercial rates for satellite transmission costs.

In short, satellite broadcasting has advantages for transmission of information to large numbers of students at relatively low cost per student. However, satellite broadcasting needs strong local support on the ground, through local centres or alternative two-way communication channels such as telephone or the Internet. These ground costs and the constraints on learning considerably reduce the economic and educational benefits of satellite broadcasting. Furthermore, well-designed printed texts can be more educationally cost-effective than real-time or even recorded satellite lectures.

VIDEO-CONFERENCING

Video-conferencing is also widely used for educational purposes, particularly in the U.S.A. and Australia, to link multi-campus colleges and universities, and for corporate training in companies with multiple sites. Video-conferencing makes use of fibre-optic cable or copper-based telephone networks and computerised compression technology to "squeeze" the high bandwidth requirements of full motion analogue television into a narrower bandwidth.

Video-conferencing is used in education for the following reasons:

- It saves instructor and student travel time between dispersed campuses, making possible the availability of some classes in sites away from the main campus.
- Teachers do not have to make significant adaptations to their normal method of classroom teaching (although special efforts need to be made to ensure students at the remote site participate in discussions and class activities).

- For corporate training the cost savings can be substantial, mainly due to savings on travel and accommodation.

There are, however, significant constraints that have prevented a wider use of video-conferencing in education:

- There are substantial installation costs, not so much for the video-conferencing equipment, but for modifications to classrooms to ensure adequate lighting and, in particular, good-quality sound. Transmission costs, especially with heavy use, can also be substantial.
- Students still have to be at a set place at a set time.
- While video-conferencing allows for more active participation by remote students than satellite TV, the larger the class the more difficult it is for all students to participate.
- The limited visual cues from the remote site and the often poor sound quality makes it a stressful environment for both students and teachers.

Video-conferencing can also be transmitted through the Internet, but currently bandwidth severely restricts Web-based applications. It is now possible to have real-time audiovisual communication between two desktop sites using relatively low-cost digital cameras and software (approximately U.S.$100 per workstation). Picture quality is poor though, and there are still major bandwidth limitations preventing multiple site video-conferencing over the Internet. Thus there have been few or no Internet applications of video-conferencing to date for regular course delivery.

In short, the technical constraints of video-conferencing limit its potential for use on a wide scale, but it can be useful as an additional resource for virtual education when used in support of the Web. It can be particularly useful for language teaching and for areas where technical or interpersonal processes need to be observed. Eventually, though, video-conferencing is likely to migrate to the Web when bandwidth increases.

COMPACT DISK TECHNOLOGY

Lastly, compact disk technology, in the form of CD-ROMs or digital video disk (DVD), is being used in a number of interesting ways in virtual education. These disks tend to be used for applications requiring large quantities of data in real time, such as multimedia applications. The disks can run on the student's local computer in conjunction with the Web; the codes on the disk are accessed from a Web site, which can then call up images from the disk. Students can then seamlessly move between Web site and disk, thus overcoming many of the bandwidth constraints of the Web.

The increased capacity of CD-ROMs and particularly DVDs facilitates a wide range of educational applications:

- Large stores (databases) of slides, photographs or computer-generated images, each one digitally coded and catalogued, can result in the same CD-ROM being used in a variety of different courses.
- Video clips or learning objects often require too much time for downloading over the Internet. Compression techniques now allow for high-quality video digital reproduction on CD-ROMs or the even greater capacity DVDs.
- Simulations enable students to enter data and see the consequences.
- A virtual lab can simulate many of the experiments and practices demonstrated in labs without the time required to set up experiments and equipment and with no worry about lack of convenient space.
- Expert systems, somewhat like games, can help students make decisions and see the consequences. The outcomes are governed by rules and procedures based on expert

knowledge. Expert systems are valuable in facilitating decision-making in complex contexts. One example is QUEST (www.sdri.ubc.ca/GBFP/index.html), which allows students to project a desired future for the Georgia Basin region of British Columbia, then examine the consequences of decisions taken now to move towards the desired future. William Massey of Stanford University has also developed an expert system that enables the learner to play the role of a university president (www.virtual-u.org). Web-based expert systems allow several players to interact not just with a central computer, but also with each other.

The main constraints of disk technology are as follows:

- The cost of development is very high (although duplication and delivery is now very cheap; it costs UBC's distance education department about U.S.$3 to duplicate and deliver a CD-ROM to a student). This means that compact disks need to replace otherwise very costly activities (such as flight training) or be used on a large scale.
- Teams of highly skilled media producers and developers, as well as subject experts, are needed.
- Learners need a relatively high standard computer and disk player because of the memory and processing requirements.
- There can exist a lack of imagination and vision in thinking of how the technology can be used for teaching purposes.
- There is concern that this a temporary technology that will be replaced when wide-band access is available over the Web.

CDs and DVDs are high-end educational applications of technology. While they indicate some of the possible future developments on a more universal scale over the Internet, good-quality disk-based educational applications are very expensive to develop and require high skill levels. However, as more and more high-quality materials become available on disks, there will be opportunities for course developers to incorporate off-the-shelf disks into their own local programmes.

SUMMARY

In summary, the Web is becoming a dominant technology where people have access to it. Because of its capacity to reach thousands of learners with a service of a defined standard, satellite broadcasting still plays a valuable role in many developing countries where a large number of learners do not have access to the Internet. Videoconferencing, on the other hand, has limited uses, is dependent on very low telecommunications costs and lacks the flexibility and potential of the Web. Computer disk technology continues to evolve and opens up a wide range of powerful educational applications. Development costs, however, are high, and hence limit its use to specific high-cost areas of education or training, or to commercial development for mass marketing.

Key Emerging Technologies

Because of the rapid rate of technological change, it is important to look not just at what is existing now, but what is also likely to happen over the next five years. A number of related and interlinked technologies that could have major implications for teaching and learning are now clearly emerging.

INTERNET AND THE WEB

The Internet and hence the Web will continue to develop. Access will widen as governments put in place national strategies such as linking all schools, providing community access and investing in infrastructure. As well, competition in a deregulated market will also widen access. Telephone companies, satellite operators, cable TV operators, and equipment companies such as Cisco and Nortel will all compete and market aggressively to provide the basic Internet infrastructure in North America.

A recent consumer technology study by PricewaterhouseCoopers indicates that Canadians have the highest home use of the Internet in the world, with 48% having home access in 2000 (see Table 2.1).

Table 2.1

Internet use at home
(by percent of population)

Country	2000	1999
Canada	48%	43%
United States	44%	43%
Europe	26%	17%

PRICEWATERHOUSECOOPERS, 2000 IN EADIE (2000).

It is important to note the trends in Internet use as well as the static data. If the diffusion of computer use follows that of other domestic consumer technology trends, at least two-thirds of Canadians will be using the Internet from home within five years. Nevertheless, research shows that the use of computer-based technology increases with education level, and the bias for home Internet use tends to be towards high and upper-middle income families. Thus there will always probably be a small percentage of low-income or other disadvantaged individuals who will not have home access.

While the majority of Canadians are still accessing the Internet via telephone, broadband use (cable, ISDN, DSL) is rapidly increasing (see Table 2.2). Recent industry projections from cable and telephone companies are that more than half of all Canadians using the Internet will have broadband access by the end of 2002. While Canada may currently have the highest Internet penetration, the same trends for greater access and increased bandwidth will continue in most countries.

Table 2.2

Main method of Internet access from home in Canada (by percent of users)

Method	2000*	1999
Phone line	58%	66%
Broadband (cable or ISDN)	29%	n/a
Other	3%	n/a

* *The totals do not add up to 100% in the study.*

PRICEWATERHOUSECOOPERS, 2000 IN EADIE (2000)

The move to broadband applications and the need to develop sustainable business models for e-commerce could also have an impact on the current pricing structure of the Internet. Its current flat rate pricing by volume may give way to pay-per-service use, especially once it becomes technically feasible to deliver on-demand television and movie programming over the Internet (see Platt, 2001, for a more detailed discussion of this issue). This may make the Internet less appealing to potential learners, although it may make it more appealing to service providers.

The rapid development of Internet services and reach in North America is also fueled by the relatively low cost of the services to the home and work place. This pricing, in turn, is driven by strong competition within the communications industry. Deregulation of telecommunications underlies this strong competition. Some countries may have strong national and social reasons for maintaining a single national telecommunications carrier or a closely regulated telecommunications system, but the cost of Internet services will be much higher in those cases and, hence, the use of the Internet much lower.

BEST COPY AVAILABLE

Such rapid spread of the technology and the increased bandwidth will have major implications for educational use. The issue then for most countries is not the direction of change, but the speed of that change. The Internet is not going away; its use is going to increase in all countries. But how fast that increase occurs will be determined primarily by economic development capacity (the ability to invest and pay for services) and by the technical ability within a country to develop and maintain the necessary Internet infrastructure. However, some countries will try to manage the market and control access to the Internet, through political means, which could slow down its development regardless of economic development and technical ability.

WIRELESS TECHNOLOGY

A second area of major technological development over the next five years is going to be wireless technology. This technology is already manifested in mobile telephony and will increase to hand-held devices such as Palm computers and laptop computers. For instance, on arrival at the Monterrey Tech campus, students can obtain a small chip to put in their laptops to enable wireless Internet access anywhere within their campus environment. The technology is cheap and will become cheaper. This means that learners will have great mobility and be able to access learning while travelling (on buses or planes, for example) or in a café without having to be hardwired.

LOCAL POWER GENERATION

Local power generation is another development that will overcome some of the infrastructure difficulties in providing a reliable Internet service. The Internet depends on a reliable and stable supply of electricity. The development of low-cost local power generation technology reduces the need for huge central investment in national power grids to reach all parts of a country. Small local power plants are springing up to offer neighbourhood users cheap electricity, thanks to not having to pay for distribution over a wasteful national grid. An added advantage of so-called "micropower" is that it will be much friendlier to the environment as well, when it is based on fuel cells that convert hydrogen direct to electricity without combustion (see *Economist*, Feb. 2001 and Mar. 2001 for a more detailed discussion of this issue).

SPEECH RECOGNITION SOFTWARE

Another area, and perhaps the most significant of all for computer use, is going to be speech recognition and voice and text translation (Economist, 2000). Speech recognition software from companies such as Lucent, Nuance and Speechworks can now understand a wide range of accents and diction without having to be trained to a specific voice. Computer languages such as VoiceXML now make it possible to write voice services in the same way that HTML makes it possible to write Web pages. With VoiceXML, the human voice becomes a substitute for a computer mouse and the spoken command for a click. The graphical user interface consisting of a keyboard and mouse is likely to disappear as a result. Full communication with a computer in the same way as with human beings may never become a possibility, but after many years of false starts and false hopes, speech recognition technology has now reached a stage where it has become reliable, cheap and useful.

The importance of this development is that it will change the nature of interaction with computers. Word commands will make it easier to operate a computer, particularly for people with relatively low literacy skills. This, in turn, will have major implications for the design of learning materials.

MACHINE TRANSLATION

Lastly, developments in machine translation will have significant implications for the use of the Internet. According to Global Reach (www.glreach.com), English is currently the predominant language of the Internet, with 48% of all Internet users being English-speaking. However, the predominant Internet languages are expected to change dramatically over the next five years. The numbers of Chinese-speaking users, which now account for just 7% of all Internet users, is expected to surpass the number of English-speaking users within five years.

It will become increasingly important for educational programmes to be available in a wide variety of languages if they are to be offered not just on a global basis, but also within multicultural communities. One way to do this is through joint course development between bilingual teams. This is the strategy of the UBC/Monterrey Tech partnership. The courses will not be translated, but will be designed in both English and Spanish, covering similar ground and as far as possible use similar readings, but will still be essentially different.

Human translation is still too expensive at the moment, but so is joint course development of this kind. The alternative is machine translation. While it does not provide perfect translation, it currently speeds up the translation by humans by 50%, and it is expected to increase in speed and accuracy within five years to the point where it speeds up human translation by 80%.

* * *

The importance of these new developments is not in their individuality but in their combined effects. The trend is all in the same direction: more powerful and cheaper technologies, wider access, and increased integration and convergence of technologies. This will inevitably increase the potential for educational applications.

In summary, the Web looks like it is becoming the dominant educational technology of the future as bandwidth increases and other technologies converge onto the Web. At the same time, it is necessary to be cautious. As bandwidth and access increases, so will the applications. The Information Highway may be subject to the same gridlock as vehicle highways: the more capacity, the more the capacity gets filled. Even more importantly though, the technology is changing more rapidly than our abilities as humans to accommodate it.

Driving and Constraining Forces of the Emerging Technologies

DRIVING FORCES

Education has never determined technological development, but always followed it. Technology is developed either for purposes of war or for business applications, and educational applications of emerging technology have followed on the coat-tails of military and business applications.

It is clear that for reasons other than education, in developed countries there is going to be increased and continuing investment in the Internet and its underlying infrastructure by governments, businesses and individuals. This investment is being made to develop and maintain a new form of economy based on knowledge and information. These new businesses will be seeking new markets.

Globalisation then — the desire for free trade and open markets — is likely to lead to increased pressure on developing countries to invest in the Internet and telecommunications infrastructure for business reasons. However, it is also critical for educational applications of the Internet that the technical infrastructure be in place. Educational applications of the Internet fundamentally depend on stable electricity provision, stable telecommunications networks, and a stable human resource capacity to build and maintain this technical infrastructure.

A second significant driving force for e-learning is the belief by corporations and investment banks such as Merrill Lynch that this is an area where a great deal of money can be made. Huge sums are being invested in e-learning initiatives. While many mistakes have been made, it is likely that sooner rather than later some corporation will develop a sustainable e-learning business.

Another pressure on educational institutions to use ICT is coming from governments and the business community. They want technology-ready workers for the new economy, and they often believe — wrongly, we shall see — that investment in technology will lead to reduced costs in education.

At the same time, a major driver of the application of learning technologies is coming from within the education community itself (Rowley et al., 1999). In those jurisdictions that saw major cuts in educational expenditures or increased student enrolments without balancing public investment over the last 10 years, teachers have seen their class sizes increasing, and hence their interaction with students diminishing. Web-based learning provides a hope for increased student interaction and access to resources that can free up the teacher's time for more direct contact with individual students.

Finally, another driver for change, and one that will become more significant as time goes on, will be the students themselves. Many students now entering universities and colleges have lived all their lives in a computer-based society. They have been playing computer games, using the Internet to listen to popular music and using mobile phone technology to communicate with their friends. Increasingly, they are expecting their educational institutions to "get with it."

CONSTRAINING FORCES

Despite the very strong pressures on educational institutions to use ICT, there are other strong pressures that limit its use. Perhaps the most important and least appreciated is the newness of the phenomenon. The World Wide Web did not exist as a public service before 1990. The first Web-based educational course did not appear until 1995. It should be remembered that it took 50 years after the first book produced by the Gutenberg press before someone hit on the idea of numbering pages. It was over 200 years later before the University of Paris allowed students access to its library. (It had resisted on the grounds that student access to books would undermine the authority of the teacher and intellectual creativity developed through oral debate.) We should not be surprised then that the Web has not revolutionised education in six years.

The Web and the Internet are disruptive technologies (Christensen, 1997). They require a fundamental rethinking of teaching practice. Students no longer are required to be at a set time and a set place to learn. Teachers are no longer the gatekeepers of knowledge. At the same time, schools, colleges and universities play a much wider role than merely transmitting information from one generation to another. They have social and cultural roles as well. Therefore educators are right to be cautious before rushing to adopt the latest technology. Education needs to match the needs of learners. Technology should be used only if and when it contributes to those needs.

Secondly, any move towards using new technologies requires significant up-front technical investment, even if for other commercial reasons the basic national infrastructure already is in place. Servers are required, computers need to be made available in classrooms, networks connected, software installed, and the technology needs to be maintained and upgraded to allow for technological change. Most public institutions, even in the richest developed countries, are under-invested in this area. As a consequence, the technology is often not conveniently available, is unreliable and requires a high level of competence and skills on the part of the teacher and often the students to use. Ironically, the inefficiencies caused by under-investment often cost more than properly investing in the first place. Nevertheless, even a well-planned investment requires initial additional spending from government and/or the institutions (Bates, 2000).

Thirdly, most institutions have not provided adequate support and training for teachers to use the technology appropriately in an educational setting. As well as technical support, teachers need help with media production and instructional design. Without this, the use of technology is just bolted onto existing practice. As a result it increases not only the teacher's workload but also the students', for marginal results.

Lastly, because the application of the Web to teaching is so new, there are very few convincing research and evaluation studies that indicate clear educational benefits for such an investment. Evidence is beginning to emerge, though, and the picture is not entirely positive. Studies on online learning by Bartolic and Bates (1999), for instance, have indicated the following:

- Online learning provides the opportunity to reach out to new markets, particularly life-long learners and international students.
- The flexibility of online learning is clearly of great value to many mature adults trying to balance work, family and study requirements.
- Many learners seem to appreciate the advantages of international courses and the opportunity to work collaboratively and closely with colleagues around the world and to have access not only to the course instructors, but to textbook authors and experts from other institutions.
- The opportunity to widen the range of potential students through online learning can make sustainable programmes struggling with small enrolments locally.
- Online learning brings major benefits through the ability to work collaboratively with students from several different countries.
- Online learning can be as cost-effective as face-to-face teaching in the right circumstances, but it is not suitable for all students or all kinds of teaching.
- Online learning can be more than cost-effective; it can actually bring in net profits for an educational institution. However, this requires a different approach to the development and management of teaching: it requires financial systems and financial management that, frankly, few higher education institutions have in place or are even ready to contemplate.
- There is a need for substantial start-up funds.
- Faculty require additional time to learn how to use these new technologies and students also have to learn to study effectively online.
- Students need to be psychologically ready and financially able to embrace this method of course delivery.

Studies funded by the Alfred P. Sloan Foundation (www.sloan.org/programs/edu_asynchronous.htm) found that:

> Asynchronous learning networks [online learning] as a medium works about as well as the ordinary classroom. Our projects seem to show a slight advantage for online learning and this message comes through from all our projects, but most clearly from the longer running projects such as State University of New York, Northern Virginia Community College, Drexel, and New Jersey Institute of Technology, where extensive teaching experience has been accumulated. The findings of these institutions are based on surveys, test and project results. However the general history of attempts to study the learning effectiveness of various media is that the medium is rarely the issue, it is the pedagogy that matters. Good and bad results can be produced by good and bad teaching. So our own more

> conservative view is that the medium works and it is up to the instructor to determine the outcome.

In short, there are important educational benefits to be had from the use of ICT in education. However, for these benefits to be achieved, a major effort is needed to provide suitable levels of investment, adequate training and a restructuring of the teaching process.

Policy Issues for Education Leaders

The issue for developing countries is not one of direction but of readiness and scale. At what point should a nation start investing in educational applications of the Internet? The short answer is immediately, but not for everyone.

If the Internet represents a significant element of the future of education, the sooner that a nation or an educational system gains experience and practice in online learning, the more economically competitive that nation is likely to become. The reverse is also true: ignoring the impact of ICT on education could substantially reduce a nation's ability to compete economically in the 21st century.

However, few developing countries have the resources, the technology infrastructure or the skilled workforce necessary to make online learning available on a wide scale, at least for many years. When resources are scarce, they need to be concentrated and very carefully focused.

It becomes then a matter of timing and priorities. We shall see that the decision to move to virtual education should to some extent depend on economic as well as educational goals.

TRADITIONAL SCHOOLS, OPEN UNIVERSITIES OR VIRTUAL EDUCATION?

One major issue is the balance between investment in the newer forms of ICT, and in particular in online learning, compared with investment in either traditional school or campus-based education, or older communications technologies, such as print and broadcasting.

Studies by Rumble (1997) and others have shown that the economies of scale of the mass media-based open universities, using print and broadcasting, offer considerable cost and sometimes quality advantages over conventional education. These cost advantages are not so apparent with high-quality virtual education.

The big difference between virtual universities and open universities is the direct interaction between the instructor and the students in virtual universities, leading to more individualised instruction. This, though, comes at a cost. Although there are some economies of scale compared with conventional education, virtual education requires a reasonable student-teacher ratio to avoid instructors becoming swamped with e-mail and discussion forum messages. What virtual education is offering is a more interactive education encouraging critical thinking, communication skills and flexibility for both students and teachers, compared with the one-way mass media of open universities.

For countries with large numbers of students unable to access the later years of secondary or higher education, the open university, mass media model is likely to be the most appropriate, particularly if the aim is to develop a mass skilled workforce able to work in industrial or resource-based industries. Open universities such as Indira Ghandi National Open University, therefore, still provide the best route for mass education (see Daniel, 1996 for further development of this argument).

For countries with already reasonable access to secondary and higher education, and a reasonable ICT infrastructure, virtual education will provide advantages over both conventional and open universities. These advantages will increase particularly for those countries wishing to move into a knowledge-based economy, but where there is a shortage of teachers in the new economy, since students can access such learning from anywhere in the world.

INFRASTRUCTURE OR EDUCATION?

Virtual education is heavily dependent on appropriate technological infrastructure already being in place for commercial or administrative reasons. Stable electricity supply and reliable and moderately priced Internet access is a necessary condition for virtual learning.

Few institutions or governments have made the necessary investment in infrastructure for educational reasons alone. While in North America the university sector initially developed the Internet, its rapid growth has been driven primarily by the business sector, although government policy can ensure more equitable access.

Government can certainly develop policies that will encourage rapid growth of the Internet, as follows:

- Deregulation of telecommunications services.
- Encouraging competition between telecommunications suppliers.
- Bulk buying of government telecommunications services (e.g., telecommunications services for all public educational institutions) through competitive bidding from suppliers.
- Encouraging Internet use through consortia of educational institutions developing and sharing virtual education materials and courses.
- Careful regulation to ensure access to all (e.g., by making it a condition of licensing that user fees are averaged between urban and rural clients).
- Offering tax breaks to infrastructure suppliers to encourage investment and/or offering tax breaks on computers and Internet services to end users to encourage greater use.
- Supporting open and corruption-free licensing practices to encourage genuine competition.

Some governments decided to invest heavily themselves in the basic infrastructure because of lack of investment by the private sector. For these governments — for all governments — the trick is to know when to open up the management of Internet services to the private sector once a market has been created.

However, until there is a basic and reliable Internet infrastructure in place, connecting at a minimum to most key businesses and universities, virtual education is unlikely to be a realistic or practical choice.

THE NEED FOR TRAINING FOR VIRTUAL EDUCATION

Even if the infrastructure is in place, there must be a national capacity to supply the necessary trained people to support and sustain virtual education. As well as having people who can install, manage and maintain the necessary technical infrastructure, virtual education also needs skilled media producers, such as Web designers and instructional designers.

Unfortunately, there is a global shortage of people with these skills. The danger is that a country will provide the necessary training, then the learners will emigrate to countries able to pay more for their services. Nevertheless, without such a skilled workforce to support it, virtual education will not work.

DEVELOPING A MINIMAL VIRTUAL EDUCATION STRATEGY

Even the poorest countries probably cannot afford to ignore totally the potential of virtual education. At the very least, a country's leaders need to be computer literate, to know how to use and navigate the Internet and to understand not just the technology but its importance for national development. The minimum, then, most countries should do is to ensure that key government offices, businesses and universities have Internet access.

The role of the university in particular is important. A prestigious national university can provide a model of the benefits and services available through the Internet and develop at least an elite with the skills needed to service national technical and educational needs for ICT development and for virtual education. This will enable the nation to build an affordable and targeted technology infrastructure, to participate in regional collaborative projects, to develop partnerships with institutions in other countries, to identify and adapt suitable programmes from other countries and to develop its own programmes where appropriate.

Conclusion

It is clear that ICT capacity will continue to expand at a rapid rate throughout the world. This expansion will be driven primarily for commercial purposes, but it will also provide the opportunity for economically important educational opportunities. Probably no country can afford to ignore this development.

However, virtual education requires a very stringent set of conditions for it to work successfully. For these conditions to be met, there is a high cost in terms of investment and training. Most importantly of all, the technological infrastructure must be in place. While the technology underpinning virtual education is developing rapidly, the most valuable developments for poorer countries are not yet commercially available or developed.

Virtual education is not the answer to many of the most pressing educational problems faced, particularly by poorer developing nations. Other strategies, such as open universities, can provide greater access and more cost-effective delivery of education.

Governments can do much to encourage the right environment for virtual education. Indeed, governments cannot afford *not* to expose at least a minimum number of its nationals to the benefits of virtual education. The poorer the country, the more focused its efforts to support virtual education will need to be. Partnership with more developed countries, collaboration between countries with similar cultures and stages of economic development and well-targeted, small-scale projects will all help develop capacity and skills in virtual education.

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4

Object Lessons from the Web: Implications for Instructional Development

MR. DAVID PORTER

Introduction

Educational institutions and organisations worldwide continue to experience changing learner expectations fueled by technology innovation and the expanding possibilities for personalised learning. With the development of the Web as a viable medium for learning and self-directed study, education providers are increasingly able to provide learning opportunities in a more flexible and customer-aware manner. But many continue to replicate traditional educational models using the new medium.

While the Web world focuses its attention on knowledge management, customer profiling, and e-business practices, many education institutions continue to automate traditional instructional and administrative practices. For most institutions, courses continue to be the standard units of instruction, the "one-size-fits-all" building blocks of academic credit, even within the virtual education arena. Very few have considered the idea of component-based instructional units, "learning objects," and complementary business systems and student service models that have the potential to revolutionise instructional practice.

The growing currency of distance and distributed learning practices has instilled in learners the expectation that educational institutions can provide them with personalised study options to their homes or to their places of employment. Software developments such as the music distribution system Napster have demonstrated that Web-based environments that are accessible to the masses can build an enormous following of loyal users, provided they give users what they want in a convenient and Web-centric manner. The challenge for educational institutions offering virtual programmes is similar, yet few seem able to achieve the promise of education to the masses in a convenient and user-driven manner. Very few educators or institutions understand the concept of the learning object. Fewer still have even attempted to apply pure Web-centric thinking in their approach to virtual learning.

Too many traditional institutions present hierarchical views of their organisational structure to learners at the front doors of their buildings, through their academic calendars, or even through their Web sites. Instead of identifying a learner's goal and then describing potential pathways to achievement, many institutions deal more with their own institutional requirement to qualify the learner to be enrolled. This position can be attributed in part to the historically autonomous nature of institutions of higher learning, where the power resides in the hands of the institution. Many see no real need to change, even in the face of increasing competition from the private sector such as the University of Phoenix (www.uphoenix.com), or

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from private-public sector partnerships such as Cardean University (www.cardean.com).

In basic education situations, there are good examples of personalised and self-paced learning environments such as Odyssey Learning System (www.odyssey.learn.com) and PLATO Learning System (www.plato.com). These are geared to help individuals achieve their learning goals quickly and efficiently, often using a mastery learning approach. However, very few systems store or manage their learning modules in a granular, object-based structure that allows them to be reused, re-purposed or repackaged in different media for different situations. Repackaging an online, computer-managed instructional system to service the needs of a rural population in the developing world with print-based modular materials is not a situation that many, if any, instructional management systems could handle with the development and delivery architectures that are embedded within their software systems.

What learners are typically looking for from a virtual education experience is to achieve their academic or work-related goals with a focus on access, choice, flexibility, recognition of prior learning and end-to-end service. As learners become increasingly informed about the possibilities for virtual education, and as the choice of programme options expands with new players in the virtual education arena, learners will likely begin to feel power in their hands and will be prepared to exercise it decisively with those education providers that respond to their needs. For educational institutions there are some object lessons from the Web that they will need to learn if they expect to use the medium effectively. The best lesson comes from Napster (www.napster.com).

Time magazine's October 2000 feature article on Napster described the implications for Web-centric applications through the goals of Napster's creator, Shawn Fanning:

> What he was thinking was that this is the application that finally unleashes the potential of the Web, the viral growth possibilities of the community, the transgressive power of the Internet to leap over barriers and transform our assumptions about business, content and culture. He just couldn't spit out the words to convince his fellow programmers that his idea could change the world. … And, as Fanning predicted, his programme does everything a Web application is supposed to do: it builds community, it breaks down barriers, it is viral, it is scalable, it disintermediates — and, oh, yeah, it may be illegal." (Greenfield, 2000)

Aside from the apparent copyright infringement inherent in the Napster model, it would appear that its inventor got most of it right (five out of six key success factors) in terms of matching the Napster software to the opportunities presented by the Web for reaching large numbers of individuals who wish to pursue a common goal. Surely this lesson from the Web can inform the goals of virtual educators, too.

The underlying principle of Napster is the retrieval of music content from a distributed network of servers powered by a common metadata packaging scheme. In educational terms, the analogue would be the provision of access to instructional units, learning resources, assessment and accreditation mechanisms using a common packaging schema for the granular components of learning. Building an educational repository that provides access to learning objects requires standards and structures that can facilitate object storage, retrieval and aggregation to suit the needs of learners or the pedagogical intentions of instructional developers.

Like the music business transformation catalysed by Napster, there may be potential for an educational transformation as well, when learners begin to navigate learning object environments themselves, constructing knowledge from the resources available to them, with little or no institutional intervention.

Learning Objects and Structured Information

Educational institutions worldwide spend large amounts of money each year developing, adapting or acquiring learning resources and courses. The development of electronic learning resources is particularly expensive and often produces course materials that are platform or operating system dependent. The Internet and the World Wide Web are seen as vehicles for lessening dependence on hardware platforms, but even in this domain there are competing standards and different flavours of Web browsers. This situation has lead to discussion of the creation of learning objects that can operate across hardware platforms and software systems.

LEARNING OBJECTS AND THEIR ATTRIBUTES

A method for preparing learning assets for use, reuse, re-purposing and electronic commerce involves associating the structure of the educational materials with a standard classification system (metadata) that facilitates the storage and retrieval of the learning objects. The IMS Global Learning Consortium, a group of hardware vendors, software vendors, publishing companies and educational organisations, is currently promoting a metadata standard for educational material that is gaining a following worldwide, both from industry and from educational organisations (www.imsproject.org). The implication of the IMS model is that educational organisations and institutions will need to begin to observe metadata standards to ensure that their databases and repositories for print, audio, image, video and computer-based materials are accessible both for internal and for external purposes. It is also imperative that they begin to inventory their learning assets and have a plan for converting any analogue assets (primarily video) for use within a learning object economy. A starting point for educators will be in understanding the attributes of learning objects.

Granularity

The term "granularity" describes the degree of precision with which learning objects (text, image, audio, video) can be described in a learning system. Granularity provides opportunities for customisation that can allow an educational institution to re-purpose its educational assets for individuals or for groups. A common database of learning objects that is accessible to instructional designers, producers and clients in different formats represents a new way of organising learning materials in an enterprise-wide fashion.

When learning materials are organised in a granular fashion and accessible from a common database in different ways by different clients, a scalable model emerges that can be used to service niche applications as well as mass audiences. Granularity and scalability are influenced by the degree to which technical systems observe common standards and the degree to which those systems provide desktop-level access to all members of the development and delivery community.

For example, at the Open Learning Agency (OLA), grade 11 and 12 course content for the Information Technology and Media Arts curricula is re-purposed using the same metadata but with a different instructional schemas and learner profile for use as content in a teacher education programme. Instead of being offered as part of a course syllabus for grades 11 and 12, the content is offered in modular chunks that satisfy learning outcomes that teachers wish to pursue as part of a self-directed professional development programme called The Learning Lab (www.ola.bc.ca/tll).

Modularity

Modularity in learning systems is key to providing flexibility for learners. When learning objects can be modularised at a fine level of granularity and can be described by metadata as competencies, learning outcomes, lesson text elements, assessment items and other instructional elements, they can be deconstructed and/or aggregated by a development and management system into a set of elements that might represent different instances of course modules for different audiences.

Interoperability

Interoperability is a requirement for systems that manage granular learning objects. It is the retrieval and transfer of the media assets from within the systems to new delivery environments and to learners and customers that adds value to them. Learners and other education clients are in a better position to use an education provider's products when they observe platform-independent standards and can be confident that the learning materials that they acquire will work with their own systems. Content can be delivered for different client groups through open source delivery environments such as Linux, or be transformed electronically to proprietary systems such as WebCT or PLATO.

Customisation

Customisation is the market factor that will affect an institution's access to the business side of learning in the future. Institutions that are able to customise their learning offerings to meet the actual needs of learners will prosper and grow. Customisation is a complementary attribute to interoperability, and it is related directly to the granularity of the learning assets that an organisation owns. The more content an organisation owns that is finely divided into granular components, the greater the opportunity for customising learning products or learning pathways for multiple purposes, new opportunities and new jurisdictions.

If an institution wants to move away from packaging courses for single format applications and towards mass customisation, building a store of granular learning objects is the key step on that road. Observing standards like the metadata recommendations of the IMS Global Learning Consortium provides the additional opportunity to interchange, sell or buy learning objects from other institutions and publishers that observe a similar format.

Common Object Standards

The current rate of technology change requires that education providers use or have access to learning systems that meet standards and specifications commonly agreed upon by a range of institutions, publishers and technology vendors worldwide. Currently the IMS Global Learning Consortium's metadata specification is the set of standards that has captured the attention of the education and training community because of its adherence to the principles of openness and interoperability. Within such a standards-based environment, institutions can follow the lines of development that best meet their client needs without compromising their ability to participate in the commercial exchange of learning objects with other educational institutions or vendors.

Instructional Design Options

Learning objects provide instructional designers with enhanced opportunities to reuse or re-purpose granular components to suit the different pedagogical needs of individuals learners or programme offerings. For example, an instructional designer developing a very focused upgrading course in Mathematics might assemble learning objects for a particular set of outcomes in a systematic way that forms a coherent unit of study. These materials might be assembled for a computer-managed instructional system that works on the principle of mastery. Students must master developmental materials at a predetermined threshold (e.g., 80% mastery) before being allowed to move on to new materials.

A student studying for a Mathematics challenge exam might use a store of math learning objects to fine tune areas of special need without having to deal with the whole syllabus. For example, an adaptive testing system might present the student with a short test and then assemble a programme of study based on areas of weakness. Such a system could become a new business opportunity for an institution, or become a part of a normal challenge exam process that features flexible study opportunities prior to the exam.

A student learning about a particular concept in Mathematics for the first time might be presented with the learning objects in a different manner that allows for the use of learning objects to "explore" specific concepts and then build his or her own constructs and theories about mathematical principles. Such an approach would be in tune with the kinds of learning experiences that many mathematics educators would provide for students in a progressive K-12 setting.

When institutions or instructional designers assemble a large number of granular learning objects and make them accessible from an object database, instructors or students can choose to use them in ways that suit learner or client needs for particular courses or programmes. Of course, appropriate metadata (descriptors) must be attached to the learning objects to make them accessible for use.

Business Systems Linkages

Any institution that makes sure that student registration, management and business systems also observe emerging metadata standards will be well positioned for a learning object economy of the near future. To that end, discussions about customisation, flexibility and extensibility need also consider the instructional development and work flow management systems that institutions and educational organisations will use to gain access to a common pool of learning objects. They may need to model workflow concepts in relation to learning object databases in small-scale projects first, but ultimately they will need to deal with enterprise-wide initiatives. Such an enterprise-wide approach would be a key outcome for any educational organisation contemplating a major foray into virtual learning as a core function of its business.

Accomplishing an "open" model for the development and sharing of interactive educational content depends on hardware and software vendors, publishers and educational institutions agreeing on a protocol on the standards for locating and operating interactive platform-independent materials. The IMS Global Learning Consortium is the primary standards group that is promoting a structure for developing and sharing content and is based on emerging technical and metadata standards for the Internet and electronic commerce. Document-type definitions and schemas based on the World Wide Web Consortium's (www.w3w.org) extensible markup language (XML) standard will be the basis for the development of learning object content using IMS standards.

The IMS group is also promoting standards for transactions between learning systems, student information systems, learning resource libraries and the business systems of education and training institutions and vendors. These administrative systems provide the business and student service back ends of instructional systems.

As institutions and training organisations build their learning and technology plans, they must pay attention to metadata specifications, the work of the IMS Global Learning Consortium and similar standards-based initiatives. The ability for education providers to engage in collaboration or commerce in the future with learning systems from different institutions or content vendors may depend on the ability to comply with common technical standards for learning systems.

EMERGING EXAMPLES OF OBJECT MODELS IN ACTION

Learning object thinking is beginning to emerge in educational jurisdictions worldwide. A few examples are described in the sections that follow.

Canada

Educational institutions and their faculty often own valuable learning assets in the form of print materials, audio, video and computer-based media. The ability to effectively use, trade or sell learning assets in the future will depend on the ability to match assets to the needs of learners, to those of other institutions and to those of vendors who may wish to purchase them.

The Portal for Online Objects in Learning (POOL) is an example of a government-sponsored initiative in Canada that is leading post-secondary institutions in the direction of storing learning objects in a database environment (see Figure 4.1).

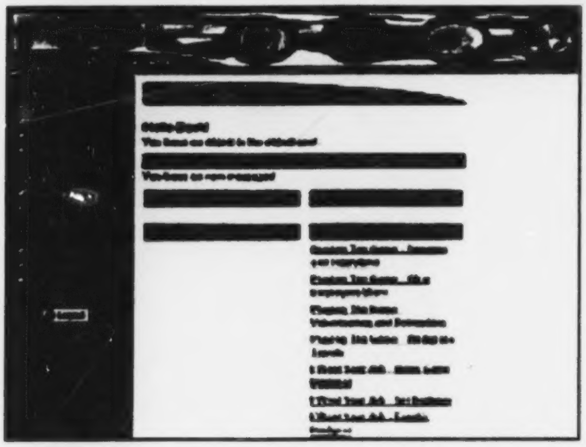

Figure 4.1. Portal for Online Objects in Learning

The Portal for Online Objects in Learning (POOL) Project creates a landmark resource for organisations that are producing learning content for online delivery. "By facilitating the management, storage and retrieval of learning objects, such as audio or video clips, simulation applets, and multimedia case studies, POOL provides organisations in higher education, workplace training, and continuing education with a gateway to learning resources and a distribution channel for their learning objects." (For more, see www.canarie.ca/funding/learning/1999 backgrounders/pool.html.)

Netherlands

The Open University of the Netherlands is experimenting with Educational Modeling Language (EML), an XML-based notational system that allows the construction of course materials from their component elements. The EML Web site describes the work as follows:

> To date no comprehensive notational system exists that allows one to codify ***units of study*** (e.g., courses, course components and study programmes), in an integral fashion. EML is the first system to achieve precisely this. EML describes not just the content of a unit of study (texts, tasks, tests, assignments) but also the roles, relations, interactions and activities of students and teachers. EML is neutral with respect to the pedagogy and mode of delivery used. One may use EML to model for instance a competence-based pedagogy, problem-based learning, performance support, self-study packages or even traditional face-to-face teaching; EML allows one to deliver learning materials on paper, on CD-ROM, via the Internet, or via e-books. EML merely records the way in which the various elements of a particular educational setting are related in order that they may be interpreted by a computer. The major EML implementation is in XML (eXtensible Markup Language), an internationally accepted meta-language for the structured description of documents and data (Open University of the Netherlands, 2001).

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Australia

At the University of Queensland in Australia, a research team lead by Jane Hunter (Hunter, 1999) is examining multimedia metadata modeling and XML schema design for incorporating rich media learning objects such as video, audio and WebTV into instructional systems (see Figure 4.2) Hunter's team develops tools, technologies and information management processes that allow organisations to locate, access, retrieve and manage information on highly distributed heterogeneous networks. Hunter's research team is providing metadata schemas to the CANARIE-sponsored POOL Project in Canada.

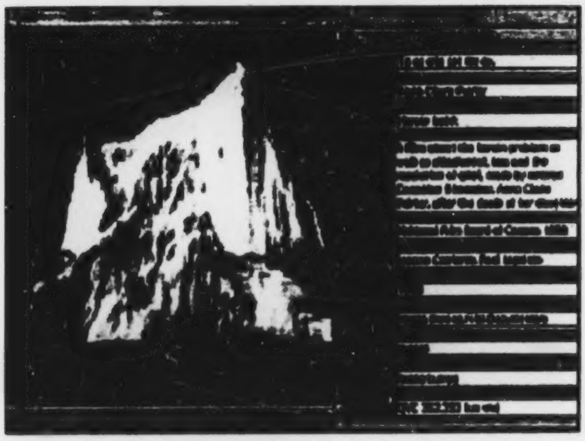

Figure 4.2 An example of an experimental video repository user interface

India

Schoolnet India is beginning to develop instructional content and multimedia resources for basic education and corporate training through its Learnet India subsidiary. Learnet India is building a software development kit (SDK) that can be used to construct and aggregate learning objects for the deployment in courseware and instructional materials. This SDK is based on the emerging XML standard and uses XML and Active X controls to integrate and author any multimedia-based title within Learnet (Learnet, 2001).

United States

The United States is the home of the IMS Global Learning Consortium, the Advanced Distributed Learning Initiative, and other standards initiatives focused on online learning. It continues to be a hothouse for learning object theories and practices.

As recently as April 2001, the Massachusetts Institute of Technology (MIT) announced an initiative that will further stimulate thinking in the learning object domain. MIT OpenCourseWare will make "course materials that are used in the teaching of almost all undergraduate and graduate subjects available on the Web, free of charge, to any user anywhere in the world" (MIT, 2001a.).

A collaborative venture between MIT and Stanford University will make available to the educational community an object-based instructional delivery and management system, called the Open Knowledge Initiative. "The Open Knowledge Initiative (OKI) addresses what is perceived by many in higher education as a critical need: meaningful, coherent, modular, easy-to-use Web-based environments for assembling, delivering and accessing educational resources and activities." The initiative is sponsored by a grant from the Andrew W. Mellon Foundation (MIT, 2001b).

How is Structured Content Developed?

One of the primary requirements for success in the virtual educational marketplace is the marriage of distinct product and service differentiation to high-quality execution. This requires a course development strategy that can provide multiple product and service streams and allow for custom designs to suit client needs. Underlying such a development process is a structured information model that applies a standards-based development and delivery framework that can align with the metadata systems such as those of the IMS Global Learning Consortium (IMS),

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Dublin Core (www.dublincore.org), the Shareable Content Object Reference Model (SCORM) (www.adlnet.org) or others that may be available. But developing and implementing multiple course options from a unified development process is a problem for many educational institutions offering virtual learning programmes.

A technology-enabled approach using a structured information can facilitate the production of courses that are Web accessible and available in formats ranging from print to CD. The key to understanding structured information is the concept of separating content from its presentation, which can be done using standard generalised markup language (SGML) or extensible markup language (XML). These are meta-languages that can be used to develop print or Web-based products that follow this separation.

For example, in a course, an informal self-assessment item might appear in a particular font or format, or in a particular position within a lesson or unit, thereby cueing learners to its significance. To the human viewer, this convention is easily understood. But for a computer there is nothing significant about this string of characters apart from it being boldface, italicised, numbered or boxed, which may also be the style used to mark a section heading or some other structural component in the course document.

In an SGML document, an explicit tag defines a self-assessment item. This tag informs the computer that it has encountered an informal assessment item, which can then trigger specific processing of this data. For example, instructional designers may wish to collect all the assessment items from a series of lessons and present them at the end of a unit as a review. If the same document is published on the Web, specific processing for informal assessment items might draw upon a database in which randomly selected informal assessment items are presented to the learner for review purposes.

The formal separation of content from presentation allows content to be presented in multiple media from a single, unified source. The styles used in a specific medium are applied to the structural or semantic tags only in final presentation. The content is not bound to a specific presentational format and can be re-purposed with greater ease.

Granular learning objects (text, image, audio, video) that are described by a classification system of metadata can be made available for product delivery from database environments using SGML and XML to describe and mark up content.

At present, there are very few implementations of structured authoring processes that produce learning objects in practice. The Open Learning Agency's development model is one example of a structured information process that can provide multiple products from a common development system. It is used to illustrate some of the concepts behind learning objects and structured information. Appendix 4.1 describes the Open Learning Agency's model of object-based development.

The Standards Groups and Their Work

The IMS Global Learning Consortium is the dominant project that has led the process for defining requirements for interoperability in learning materials. It is based on a metadata specification that permits structured information approaches to the authoring and packaging of content. While it has set the pattern for a reference model that can be applied widely, it is not alone in this work.

The Advanced Distributed Learning Initiative (ADLI) of the U.S. Department of Defense launched an implementation project in partnership with IMS in 1997 with the purpose of ensuring "access to high-quality education and training materials that can be tailored to individual learner needs and made available whenever and wherever they are required"(ADLI, 2001).

The initiative was designed to "accelerate large-scale development of dynamic and cost-effective learning software and to stimulate an efficient market for these products in order to meet the education and training needs of the military and the nation's workforce in the 21st century … through the development of a common technical framework for computer and net-based learning that will foster the creation of reusable learning content as instructional objects" (ADLI, 2001). The result of the ADLI initiative is the Sharable Courseware Object Reference Model (SCORM), an XML schema that describes the hierarchy for packaging course components using IMS metadata standards.

Another initiative that implements the IMS content packaging specification for a wider commercial audience is the Microsoft Learning Resource iNterchange (LRN) tool kit (www.microsoft.com/elearn/support.asp). By providing a learning object tool kit to the education community, Microsoft further ensures that the IMS specifications will be accessible and potentially more widely adopted. Other hardware and software vendors such as SUN Microsystems have announced similar tool kits that are IMS compliant (SUN Microsystems, 2001).

The IMS Global Learning Consortium Web site lists directories of vendors and products that currently or will shortly comply with the IMS specifications in their product and service offerings (www.imsproject.org). It is clear that when major hardware, software and product vendors get behind a standard, it has the potential to become the dominant specification worldwide. Already, there are IMS Global Learning Consortium development centres in the United Kingdom, Australia and Singapore (for the Asia region).

Wh Systems and Software Are Required?

In the Open Learning Agency example (see Appendix 4.1), structured authoring tools such as Framemaker +SGML and document-type definitions were used to produce content that could be rendered to print, to the Web or to CD-based delivery media. The files were stored in a file management system, but no attempt was made to store object elements at a granular level in a database, where the real power of learning object models can be realised.

Recently, more effective content management systems for object storage and manipulation have become available in the marketplace. Industry publications such as *KM World* (www.kmworld.com) have begun to feature content management systems that can structure and store learning objects in ways that allow them to be more easily manipulated at the object element level. As well, new content management systems can store the DTDs and XML schemas that are the keys to transforming objects into multiple distribution media.

Systems such as the Vignette Content Management Server (www.vignette.com), eBT Engenda System (www.ebt.com), and Chrystal Eclipse/Astoria (www.chrystal.com) have the capability to store learning objects at a fine level of granularity. They can also be configured to automate workflow processes and to provide rich search capabilities. When these systems are matched with a customer relationship management and profiling systems, they can be positioned to provide self-service customisation.

Vignette's Content Management Server product is optimised to power online periodicals such as *Time* magazine. A visit to the *Time* Web site (www.time.com) will demonstrate the front-end capabilities of a content management system that has back-end workflows for writers, editors, graphic designers and page layout staff. The interface presents rich search capabilities and the ability for end-users to see almost instantaneous changes in object-based content. Applying the same logic, it is possible to optimise a content management system to provide the workflows and self-service capabilities that would be required of a leading edge learning system. When the back-end database management systems are matched with authoring and media creation capabilities, a system close to the ideal of IMS Global Consortium begins to take shape.

On the front end, tools such as XML Authority (TIBCO Extensibility, 2001) can be used to design and edit XML schemas and SGML DTDs, the fundamental building blocks for granular learning structures. This is a highly technical process, but one for which instructional designers are well suited as team members. It is within the schema design process that the architecture for learning is created. Downes (2000) presents an excellent description of schemas, metadata tools and learning object-authoring processes in his online discussion paper titled "Learning Objects."

Schemas and DTDs can be used to author instructional content and associated metadata in structured authoring tools such as XMetaL (SoftQuad, 2001), Framemaker +SGML (Adobe, 2001) and Epic Editor (Arbortext, 2001). Although these tools may be somewhat foreign to many content authors and instructional designers, they represent a way of thinking about instructional content production that reinforces the separation of presentation from content rubric. The tools require training to use, and they tend not to offer the opportunities for tinkering with presentation that can consume large amounts of development and production time. They are designed for large-scale content management problems where they interface directly with content management repositories, enabling version control, check-in and checkout workflows, reuse and re-purposing of content fragments or complete documents of any file or media type.

When content authored using XML-aware tools is matched with an object-enabled management system, it is possible to leverage other tools in the virtual sphere to add additional value. Many content management systems also come packaged with e-business applications and customer relationship management systems. These value-added tools provide the opportunity to profile customers and use the information collected to customise offerings to suit end-user preferences, as well to transact the financial details such as credit card payments for course modules or associated sales of books and media resources from other Internet e-business partners. Instead of seeing content or course authoring as a standalone activity in an educational organisation, the Web-centric trend is to see the operation of an educational organisation as an integrated whole that can provide customised service to all of the organisation's learners and clients.

A new class of tools that supports object-based methodologies is now emerging in the corporate training sector. Learning content management systems (LCMS) that consist of a learning object repository coupled to an automated authoring application, an online delivery interface and an administrative application are becoming available from a number of vendors including Knowledge Mechanics (www.knowledgemechanics.com), WBT Systems (www.wbtsystems.com), and LeadingWay Knowledge Systems (www.leadingway.com). These LCMS systems have the potential to highly automate the development, management and deployment of training content. They also signal the potential for the emergence of analogous systems optimised for the formal education sector.

Implications for Education Organisations

An instructional development environment enabled by a learning object model presents an enormous opportunity to educational organisations that are just now ramping up with virtual education products. They can design modularity and metadata into their products from the beginning with no legacy encumbrances. They can build systems that integrate business and customer support functions with instructional development and delivery functions. They can consider their instructional materials as true assets that will be archived, revised and upgraded over time. The object assets will be available for trade or sale in an e-commerce system that tracks their usage and assigns costs and royalties appropriately. The metadata associated with the learning objects will make them easy to find on the Web and provide streamlined paths for users, whether for instructional purposes or for commerce in the objects themselves.

Examples of collaborative sharing models based on learning object attributes are already visible in the public education space. The Multimedia Educational Resource for Learning and Online Teaching (MERLOT) is one example of a consortium approach to providing online resources for faculty and students. MERLOT was created in 1997 by the California State University Center for Distributed Learning as "a free and open resource designed primarily for faculty and students in higher education. Information hosted in MERLOT is free to use for educational, non-commercial purposes, and materials linked to by MERLOT have a range of licence agreements from public domain to commercial" (www.taste.merlot.org).

In the commercial space, there are many more examples of learning object models. BitLearning.com ("one byte at a time") is one example of a private sector company selling small modular components on a granular scale at a granular price (www.bitlearning.com). Viviance.com (www.viviance.com) uses a much more sophisticated approach, targeting business customers with personalised training opportunities based on a learning object approach. Viviance's marketing goal would be to demonstrate a return on the investment of training dollars against the corporate directions of the organisation, measuring learner performance against the fiscal bottom line.

For organisations with a longer history in virtual education, or for institutions with large stores of legacy content and learning resources, the challenge of the object economy is much more difficult. Decisions have to be made about identifying valuable instructional assets, modularising them, adding metadata and managing them in a format that allows for efficient storage and retrieval. For most traditional organisations, the move to a learning object model could be labour-intensive and expensive.

A recent Goldman Sachs Equity Research report on the value of content in business-to-business (B2B) applications cited content management and the creation of "order from chaos" as the underlying routes to success for most existing organisations that want to be players in the content business (Goldman Sachs Equity Research, 2000). Typically, content-rich organisations like educational institutions have massive amounts of unstructured instructional content that is not catalogued in any consistent manner and often not formatted in any consistent file type. The report documents processes that can be used to "aggregate, cleanse and rationalise" information so that metadata schemas can be applied before it is published in a catalogue or content management system where internal end-users or external commercial partners can get access to it. While the Goldman Sachs (GS) report is aimed at publishers and commercial organisations, the same principles would apply to educational institutions.

The GS report notes that XML is "a key technology in the B2B revolution." By using an XML tagging schema based on a metadata standard and coupled with a packaging specification for instructional materials, educational organisations empower themselves to participate in emerging shared resource consortia such as MERLOT or in commercial ventures with e-learning companies. It is imperative that educational organisations, particularly virtual education institutions, realise that a content management system is a requirement for success in this milieu. The GS report describes nine content management systems that are offered as standalone systems or as services through application service provider (ASP) outsource agreements.

Implications for Instructional Developers

Instructional developers in virtual education environments either act alone or as a part of a team. In a typical university scenario, courses that instructors or professors have offered in a face-to-face environment have been converted to online, Web-based offerings, or have been extended to take advantage of unique features of the Web such as asynchronous access to course materials for self-directed study. In many cases the instructor is given training in a particular online development, delivery and management tool such as WebCT (www.webct.com) or Blackboard (www.blackboard.com) and then the instructor proceeds to craft a course for online delivery. The pedagogical structures embedded within the instructional delivery tool are tweaked to suit the needs of the class, the content or the particular instructional problem. In most cases, the courses are hand tooled and kept current through the intervention by the instructor over time.

In large-scale distance education and distributed learning environments a more industrial model can be viewed. Typically a team approach is used that includes subject matter experts, instructional designers, graphic artists, Web designers, online delivery specialists and help desk staff. There is a specialisation in team roles that plays out throughout the development process. Instructional designers usually oversee a course through all stages of development and production, ensuring consistency and conformity with institutional guidelines for course production. Courses in a large-scale environment tend to be reviewed periodically and are updated based on feedback from students, tutors or instructors. When taken to the Web, instructional materials are either developed as standard HTML or they are produced in an instructional delivery and management system such as WebCT.

In both cases, content and presentation become a blend that is difficult to separate into constituent parts after production has happened. Updates and revisions occur across the entire work. Reuse or re-purposing of granular components is currently a labour-intensive process. Revision control is difficult beyond the level of the entire work. Use of modular components of a course for another purpose is difficult, if not impossible. If a new instructional delivery application ("killer application") comes along after many courses have been created, the changeover of all content to the new system would be expensive and time-consuming.

The lesson here for instructional developers is a consistent theme: keep content and presentation separate throughout the life cycle of instructional materials. The advantages of this approach are all about opportunity:

- The opportunity to produce instructional content at the course or modular component level from a common content source repository.
- The opportunity to deliver content in multiple media (Web, print, CD) from a common content source repository.

- The opportunity to custom deliver content in any instructional delivery system (WebCT, Blackboard, etc.) now, or in the future, from a common content source repository.
- The opportunity to provide user-driven pathways through a common content source repository.
- The opportunity to produce new products now or in the future from a common content source repository.

To accomplish the goals outlined above means that instructional developers need to become familiar with learning object theory, metadata classification standards, instructional materials packaging schemes, content management systems, authoring tools and instructional delivery tools. And all of these related topics need to be enabled within an enterprise-wide system for the potential of the learning object approach to be realised in instructional development. Figure 4.3 illustrates the potential for multiple product outputs when content and presentation are separated, and Figure 4.4 illustrates an example of an enterprise workflow that enables granular development of content and multiple media production.

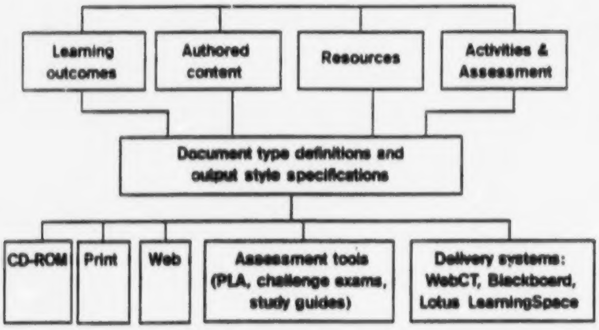
Learning outcomes
Authored content
Resources
Activities & Assessment
Document type definitions and output style specifications
CD-ROM
Print
Web
Assessment tools (PLA, challenge exams, study guides)
Delivery systems: WebCT, Blackboard, Lotus LearningSpace

Figure 4.3: Separating content from presentation using document type definitions (DTDs).

Implications for Learners

If what learners are typically looking for from a virtual education experience is to achieve their academic or work-related goals with a focus on access, choice, flexibility, recognition of prior learning and end-to-end service, then learning object models can be used to facilitate such an experience. For example, a learning object enabled instructional system coupled to a customer relationship management system (a.k.a. student information system) that provides user planning and personalised tools and e-commerce business functions can be configured to guide students through a learning experience in a manner that validates their needs, expectations and experiences.

Students usually enter an educational programme with an end goal in mind. For example, suppose a particular student wants to complete a Bachelor of Business Administration (B.B.A.) degree and already has some past training or work experience that she feels deserves academic recognition. From the moment the student first reaches the virtual school's Web site, she is profiled by the system to ensure that relevant information is presented about programmes and requirements. A personal learning plan is begun by the student and she is prompted to list past training and academic credit for review by advisers and credential evaluators who are empowered to grant credits of prior learning experience through transfer credit.

The student can also gain advanced credit through the development of a portfolio and record of learning that can be completed through a self-service, Web-managed system. Alternatively, the student can choose to write a challenge exam based on the competencies for the B.B.A. degree to attain credits of prior learning. The transfer exams are randomly generated from a set of assessment items in the object repository for the B.B.A. programme and matched to the competencies

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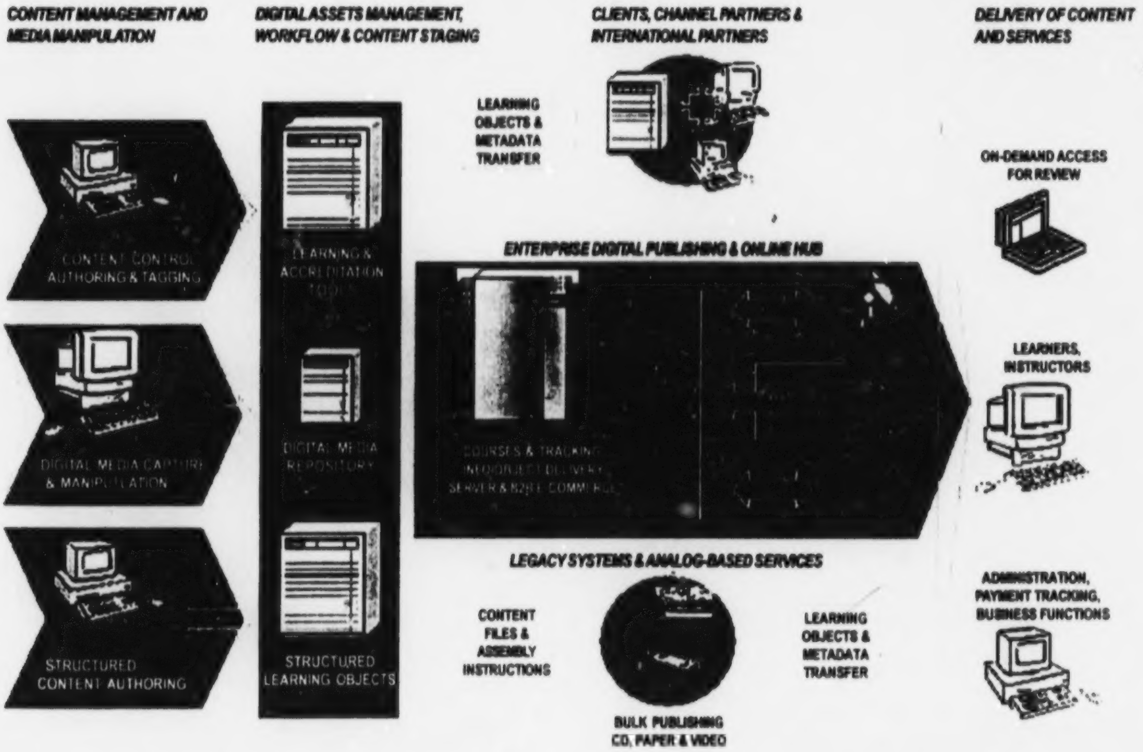
CONTENT MANAGEMENT AND MEDIA MANIPULATION
DIGITAL ASSETS MANAGEMENT, WORKFLOW & CONTENT STAGING
CLIENTS, CHANNEL PARTNERS & INTERNATIONAL PARTNERS
DELIVERY OF CONTENT AND SERVICES
LEARNING OBJECTS & METADATA TRANSFER
ON-DEMAND ACCESS FOR REVIEW
CONTENT CONTROL AUTHORING & TAGGING
LEARNING & ACCREDITATION TOOLS
ENTERPRISE DIGITAL PUBLISHING & ONLINE HUB
LEARNERS, INSTRUCTORS
DIGITAL MEDIA CAPTURE & MANIPULATION
DIGITAL MEDIA REPOSITORY
COURSES & TRACKING INFO/OBJECT DELIVERY SERVER & B2B/E COMMERCE
LEGACY SYSTEMS & ANALOG-BASED SERVICES
ADMINISTRATION, PAYMENT TRACKING, BUSINESS FUNCTIONS
CONTENT FILES & ASSEMBLY INSTRUCTIONS
LEARNING OBJECTS & METADATA TRANSFER
STRUCTURED CONTENT AUTHORING
STRUCTURED LEARNING OBJECTS
BULK PUBLISHING CD, PAPER & VIDEO

Figure 4.4: Example of Enterprise Workflow for Instructional Development and Delivery

or learning outcomes that the student wishes to challenge.

After the student's prior learning is assessed and her record of learning is updated to match, the student begins to make choices from the pool of available course modules for the degree programme. Each of the course modules is a discrete unit of learning matched to the outcomes for the degree, allowing for multiple pathways to degree completion based on a balance between foundation competencies required of all students and competencies based on thematic modules that can be taken to pursue a particular passion, interest or professional need.

All of the course modules are accessible via a Web-based instructional delivery system using the current "killer application" of the genre. The instructional objects are kept up to date by a team of subject matter experts and instructors who receive feedback from students on an ongoing basis and who make revisions or additions to the pool of objects as needed. The objects are dynamically assembled from a content management database and delivered to the students using the instructional delivery system. Each object in the learning object pool for the B.B.A. is tagged with standard metadata.

The assessment objects are logically related to the learning outcomes and learning activities and tagged with appropriate metadata. Activities and resources share the same metadata scheme, so it is possible to provide content to students with activities, resources and assessment items that are matched. For any learning outcome in the programme there may be multiple pathways to demonstrating competence.

The resource objects can be text, animations, graphics, interactive simulations, audio, resource persons, streaming video case studies or any file type that can be stored in a database and tagged

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with metadata. Digital publishers who have licensed access to their learning resources on an object basis provide many of the resources available to students. An e-commerce system tracks usage statistics to substantiate royalty payments and help to guide licensing decisions for further use of the publisher's learning object resources.

Students can do self-assessment exercises at any time by searching a set of assessment items based on learning outcomes against which they want to be tested. The pool of self-assessment objects is tagged differently from the formal assessment items that instructors may wish to use to randomly generate test or exams for students. Theoretically, the student could self-navigate the entire set of learning outcomes and meet the formal requirements for the B.B.A. degree without any instructor intervention, provided that fully asynchronous pathways are allowed by the programme designers.

The B.B.A. example is not theoretical. It is achievable when a learning object model underpins an instructional development and delivery system, where metadata standards are used to structure the instructional materials in a learning object repository. When the learning object repository is matched with appropriate customer relationship management and business systems that share information using XML-based data transactions, an enterprise-based approach to learning management is achieved.

What is a Learnster?

"Learnster" is analogous to the self-service community-building functions of Napster, but is localised in the online learning world. It refers to the concept of a community of learners who can gain access to courses and learning objects using software-based metadata searching tools.

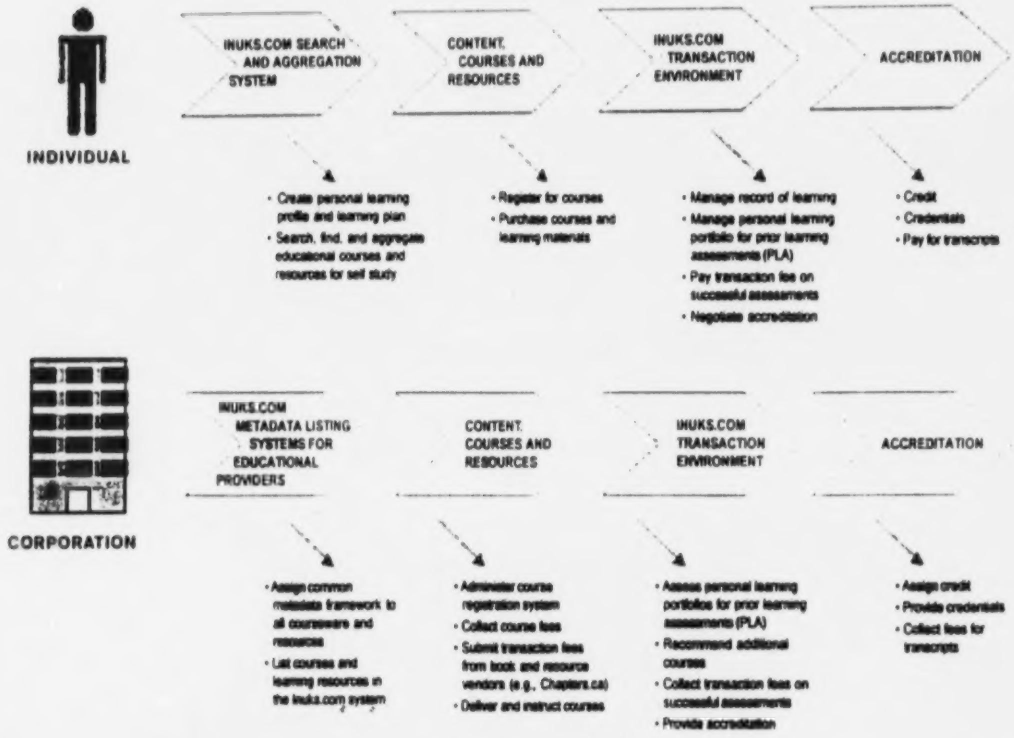
INDIVIDUAL
INUKS.COM SEARCH AND AGGREGATION SYSTEM
CONTENT, COURSES AND RESOURCES
INUKS.COM TRANSACTION ENVIRONMENT
ACCREDITATION
• Create personal learning profile and learning plan
• Search, find, and aggregate educational courses and resources for self study
• Register for courses
• Purchase courses and learning materials
• Manage record of learning
• Manage personal learning portfolio for prior learning assessments (PLA)
• Pay transaction fee on successful assessments
• Negotiate accreditation
• Credit
• Credentials
• Pay for transcripts
CORPORATION
INUKS.COM METADATA LISTING SYSTEMS FOR EDUCATIONAL PROVIDERS
CONTENT, COURSES AND RESOURCES
INUKS.COM TRANSACTION ENVIRONMENT
ACCREDITATION
• Assign common metadata framework to all courseware and resources
• List courses and learning resources in the inuks.com system
• Administer course registration system
• Collect course fees
• Submit transaction fees from book and resource vendors (e.g., Chapters.ca)
• Deliver and instruct courses
• Assess personal learning portfolios for prior learning assessments (PLA)
• Recommend additional courses
• Collect transaction fees on successful assessments
• Provide accreditation
• Assign credit
• Provide credentials
• Collect fees for transcripts

Figure 4.5: The Value Chain for Virtual Education

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Learners can become learnsters by using self-service tools to find learning resources, registering for courses, participating in learning communities and tracking their own records of learning.

Institutions can make their courses accessible by listing them for search tools to find and by providing self-service registration and participation processes via the Web. Like eBay (www.ebay.com), the online learnster community would provide a self-service, community-based transaction environment in which learners could seek accreditation for their formal and non-formal learning records, and institutions could add value for learners by offering additional courses and credit review functions that would ensure that learners could receive recognition for all their learning experiences. There is a value chain in this model that works for both learners and institutions (see Figure 4.5).

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Appendix 4.1
An Example of Object-Based Development: Open School

The sections that follow have been described in greater detail in a series of Open Learning Agency papers and presentations by Klassen, Maxwell and Norman (1999) and in workshop presentations by Porter (2000).

The Open School is a service of the Open Learning Agency (OLA) focusing on K–12 curriculum. It provides distance education courses and resources for students in British Columbia, Canada. Open School grew out of the British Columbia Ministry of Education's correspondence and distance education programme unit that had traditionally produced print-based correspondence courses. From 1993 onwards the correspondence and distance education group, and later the Open School, experimented with distributed learning technologies that used proprietary client-server applications, Web-based course delivery, online student collaboration, database-driven competency-based systems and engaging virtual environments. While many experiments were highly successful from a student perspective, they were often costly or difficult to scale from a system perspective.

During the 1996–2000 period, British Columbia school districts became increasingly interested in servicing all of their students, regardless of location or situation, and were willing to take on distance and distributed delivery models on an experimental basis. From this change in thinking, the Open School learned that to meet the needs of an ever-expanding and changing client base, OLA needed to embrace new models of delivery and services beyond the traditional correspondence course model. Open School courses and resources needed to be assembled in a more flexible manner, customised for client groups, available in multiple media and accessible to as many students and teachers as possible.

For most distance education providers, scale is a critical decision factor in the development process. Practical issues such as the level of customisation becomes an issue when the development of courses for alternate media, for different types of learners, and for a variety of instructional contexts is desired. Creating a unified development framework that could produce multiple course output formats became a provocative notion for OLA management and staff.

A New Framework

In 1996 Open School began work on a unified framework for course development and delivery (Klassen, Maxwell and Norman, 1999). The initial list of desirable attributes for the framework included:

- A learner-centred approach to design, development and delivery of learning resources.
- Electronic synchronous and asynchronous communication between learners and teachers.
- A modular course development process based on structured information.
- Choice and flexibility in delivery formats.
- A resource-rich environment for students.
- Custom views of materials for different types of learners.
- Resources identified, associated and categorised within the course architecture.
- Parts and pieces of course materials stored and managed.
- Output to print and the Web, as well as to other media such as CD-ROM.

When the project began, there was no single tool that could address all of the desired attributes of the system, so Open School proceeded with an internal research and development project to find a solution. It began by an examination of structured information techniques and of standard generalised markup language (SGML), one of the more important innovations in publishing and knowledge management. In 1997, Open School's research and development team began work on an SGML-based course development and delivery framework.

The Open School Courses and Resources Project

The Open School research and development team spent much of 1997 and 1998 developing and testing the new course development and delivery framework. In 1998, Open School decided to implement the new framework with 14 grade 11 and 12 courses as part of a new initiative called the Open School Courses and Resources programme (OSCAR). The programme was designed to provide high school students with enough credits to earn a high school diploma, working entirely online or in print.

The development group consisted of 30 people that included instructional designers, writers, production staff, a small technical team and a management team. This group identified and deployed software tools and environments for authoring, middleware processing and delivery. Some of these tools included Adobe FrameMaker+SGML, AIS Balise, Microsoft Internet Information Server 4.0, Microsoft SQL Server, Microsoft Visual Basic, and Microsoft Visual InterDev.

After this successful experimental project was completed in 1998, Open School decided to pursue a structured information approach to course development and delivery. At the time, SGML-based publishing was the domain of the technical writing community with very few educational institutions involved in this style of content development. OLA saw this as an opportunity to develop as a prototype an innovative practice in distributed learning and to provide a base of knowledge that could be moved out across the whole organisation. Figure 4.6 illustrates an idealised schematic architectural view of the system OLA sought to implement to re-engineer its content development and delivery models.

Structured Information Standards

SGML is an international standard for text and document processing — a meta-language that provides a common syntax and notation to create specialised markup languages for specific domains: in OLA's case, distributed learning. Any markup language that conforms to the standard can be used with a wide assortment of SGML and XML tools and applications.

Defining the structure of documents is the major feature of an SGML or XML-based markup. This allows computers to recognise structural components and metadata in a document, structures that traditionally have only been implied by presentational cues. Using SGML and XML allowed Open School to design programmes that succeeded in separating content from presentation and, therefore, did not limit content to a specific format or medium.

Other emerging standards influenced the design of the Open School course development and delivery framework. Many Open School courses refer to or include various learning resources. In order to classify and categorise resources in their materials, the team needed clear structures for managing metadata. The team looked to and was informed by the Dublin Core metadata set. It found, however, that local extensions were required to describe the wide variety of resources in OLA course material.

Similarly, the IMS Global Learning Consortium's metadata work was another standard the team looked to for insight. Although the IMS metadata standard was well thought out, it had yet to be realised in SGML or XML. OLA continues to incorporate IMS-derived metadata mappings to its metadata structures. A newer subset of IMS metadata, called CanCore has been developed by the University of New Brunswick Library for the Portal for Online Objects in Learning and may be the metadata framework that Canadian institutions will adopt as a standard (Fisher, 2001).

Finally, the new XML standard itself could provide institutions with SGML-based content assets the ability to easily interchange content with others. But XML has drawbacks that result from its newness; parts of the XML family of standards has yet to be finalised. While this does not inhibit the use of XML, it does restrict it to the more complex requirements of OLA documents and overall system, which were better addressed by SGML. Currently, OLA is preparing to move entirely to XML and an SGML and XML-enabled content repository.

The Open School Development Process

The power of a structured development process that produces granular learning objects is the ability to finely describe the elements in instructional materials by tagging them with metadata so that they can be easily stored, retrieved and aggregated in formats that support learner needs. On the front end of the development process, learner profiles are developed that become the use cases against which flexible alternatives for activities and assessment can be created during the course development process.

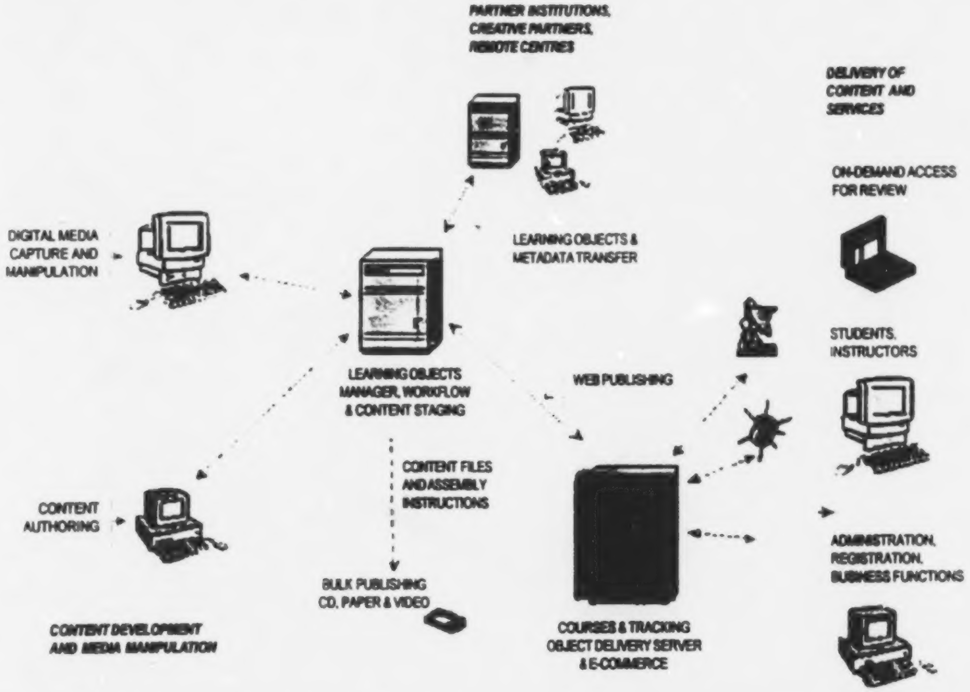

PARTNER INSTITUTIONS,
CREATIVE PARTNERS,
REMOTE CENTRES
DELIVERY OF
CONTENT AND
SERVICES
ON-DEMAND ACCESS
FOR REVIEW
DIGITAL MEDIA
CAPTURE AND
MANIPULATION
LEARNING OBJECTS &
METADATA TRANSFER
STUDENTS,
INSTRUCTORS
LEARNING OBJECTS
MANAGER, WORKFLOW
& CONTENT STAGING
WEB PUBLISHING
CONTENT FILES
AND ASSEMBLY
INSTRUCTIONS
CONTENT
AUTHORING
ADMINISTRATION,
REGISTRATION,
BUSINESS FUNCTIONS
BULK PUBLISHING
CD, PAPER & VIDEO
CONTENT DEVELOPMENT
AND MEDIA MANIPULATION
COURSES & TRACKING
OBJECT DELIVERY SERVER
& E-COMMERCE

Figure 4.6: Idealised Architecture for Structured Content Development and Delivery

A generalised, four-phase approach that has been used by the Open Learning Agency illustrates how structured information processes and metadata standards are integrated within an instructional development process.

PHASE ONE: REQUIREMENTS CAPTURE AND ANALYSIS

- A planning team assembles to address the business case, collect requirements and prepare for the instructional design phase.
- The team reviews the British Columbia Ministry of Education's *Integrated Resource Package* (IRP), the baseline document for curriculum standards, assessment strategies, instructional strategies, prescribed learning outcomes and recommended learning resources.
- The team reviews existing course materials, resources and software.
- Input from field-based consultants (usually teachers) is solicited.
- Learner profiles are identified including learner motivation, level of instructional support needed or available technology access.
- Use cases are described for delivery to home, school and learning centre.
- Alternate assessment and instructional strategies are considered.
- The instructional design plan is completed for the course.

Figure 4.7 shows the structured content development model that maps learning objectives and the content hierarchy for courses to a series of nodes that can be represented in an object database. (DTD = document type definition; see next section.)

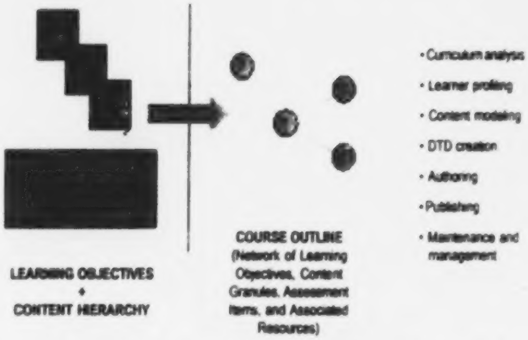


Figure 4.7: Content Development Model

PHASE TWO: INSTRUCTIONAL DESIGN

A Document Type Definition (DTD) supports each individual stage in the instructional design phase. A DTD is the formal set of rules and element definitions that govern what structures are allowed or required in a document (see Figure 4.8).

In *stage one* of instructional design, these are:

- The course outline is created using an SGML document type definition (DTD).
- The course outline consists of a hierarchy of major subjects or topics, abstracts for content to be covered, and facets or themes (important subtopics that may pervade the course but are not represented in the major subject/topic hierarchies).
- The initial instructional design DTD requires a four-level hierarchy of *nodes:* course, module, section and lesson.
- The learning outcomes are positioned at the section and lesson level to serve as determinants for formal and informal assessment.

This first stage of the instructional design plan is an idealised mapping of subject/content and learning outcomes. It does not mean that this hierarchy is the only "view" of the course a student will see. It is, however, a solid foundation on which to build materials that can be reassembled during presentation and delivery.

Stage two of the instructional design phase involves resource identification and association with the overall course architecture created in the first stage. Resources are further decomposed by annotation, describing their scope and relevance to particular nodes in the course hierarchy. This stage allows many different resources, textbooks, articles, online links, video clips and CD-ROMS to be appropriately situated within a course.

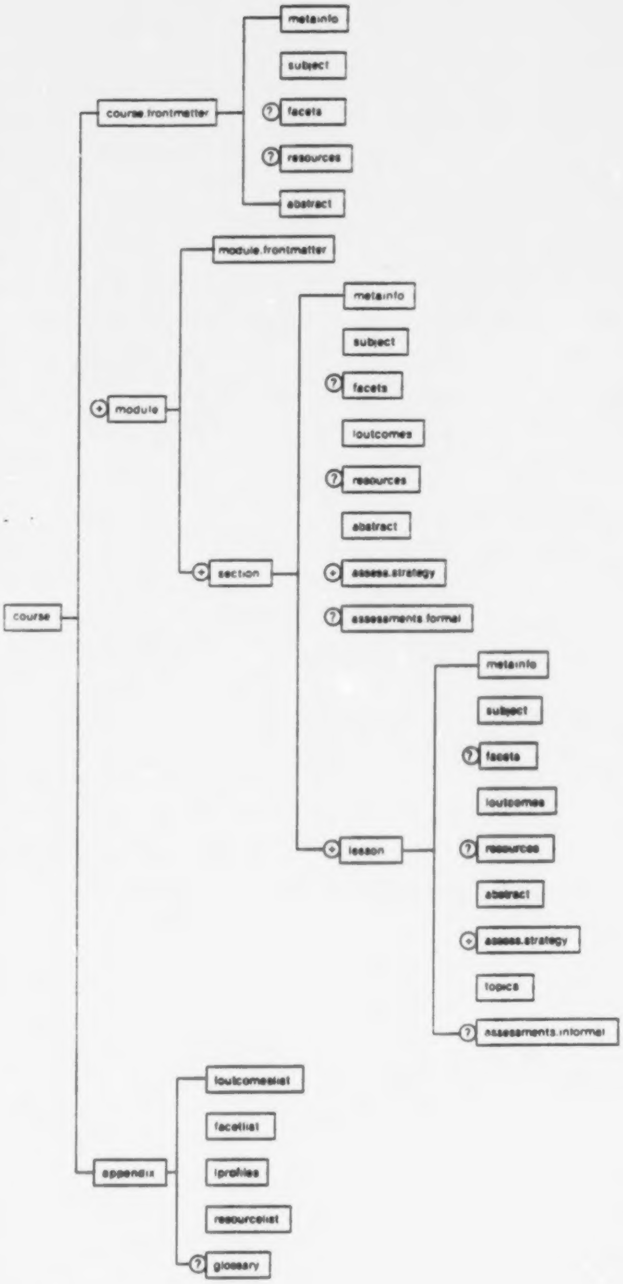
During *stage three*, assessment strategies are designed for both formal and informal assessment at the section and lesson level. Each assessment strategy is written for one or more learner profiles. The strategies allow instructional designers to indicate resource dependencies and declare the type of assessment to be used in the activity or assignment.

Completion of this development stage requires that all sections and lessons contain assessment strategies for all learner profiles designed for the course. Instructional designers are encouraged to develop multiple alternatives for each profile if the schedule allows.

An optional *fourth stage* (in development) of the instructional design process is intended to provide designers with the opportunity to develop alternate instructional strategies at each level of the course hierarchy. This stage facilitates:

- Alternate subject/topic hierarchies at all levels.
- Custom sequencing of materials (requires existing structured content).
- Custom assembly of materials for specialised learner profiles (e.g., learners with special needs).
- Experimental approaches to learning.

The completed instructional design plan, an SGML or XML document, becomes the supporting framework for course authoring. All of the information in the design plan is included in the software-based authoring environment. This ensures that the authoring process is tied directly to the original specifications laid out by the instructional design team.


course
course.frontmatter
metainfo
subject
? facets
? resources
abstract
+ module
module.frontmatter
metainfo
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? facets
loutcomes
? resources
abstract
+ section
+ assess.strategy
? assessments.formal
+ lesson
metainfo
subject
? facets
loutcomes
? resources
abstract
+ assess.strategy
topics
? assessments.informal
appendix
loutcomeslist
facetlist
lprofiles
resourcelist
? glossary

Figure 4.8: A Schematic View of an Open School Document Type Definition (DTD)

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PHASE THREE: COURSE AUTHORING

As with the instructional design phase, the authoring phase is supported by an SGML DTD for every stage.

In *stage one* of the course authoring phase, assignments and activities are developed in response to assessment strategies articulated in the instructional design plan. Authors create assignments and activities from standard architectures defined in the authoring document type definition. Criteria for assessment (answer keys, marking rubrics, feedback mechanisms, etc.) are required and, therefore, incorporated in the architectural template for activities and assignments. Alternative assignments and activities that address particular learner profiles are authored and stored in the database.

In *stage two*, topic explorations are created based on the instructional design specifications for each lesson. Topic explorations are composed of text, graphics and multimedia elements appropriate for one or more learner profiles. Alternate topic explorations are encouraged for each lesson.

The result of *stage two* is a collection of peer topic explorations and activities written for one or more learner profiles. At this stage it becomes possible to select the appropriate topic explorations, activities and resources for an individual learner profile from the overall course architecture.

In *stage three*, overview material and front matter are created. This may include learner profile-dependent advance organisers, transitional components and support materials.

An optional *fourth stage* (in development) provides authors the opportunity to address alternate instructional strategies described in stage four of the instructional design document.

The completion of the authoring phase provides a highly structured representation of a course in its entirety. In fact it is a superset of all possible course instances that can be derived by individual learner profiles.

PHASE FOUR: DELIVERY

The fourth phase of the course development and delivery framework focuses on producing course instances for delivery. At this point in the process, the advantages of structured information come to the fore. An array of structured information software tools and techniques are used to bring content and style sheets together to provide presentations for the Web, for print, and for CD-ROM.

- Each individual SGML/XML element and its attributes are leveraged by processing tools and associated with presentational rules.
- Using style sheets and transformation rules, the production team produces both print and online instances of each course. This process is driven almost entirely by SGML/XML programming tools; very little hand tooling is required. A single set of style sheets and transformation rules can be applied to all courses.

Standard ways of presenting course components were developed through consensus and were implemented after the authoring stage, in the production phase.

In the beginning, team members struggled with this separation of content and presentation. Once they saw the published results of the first stages and how their material began to take shape in print and online, much of their discomfort was alleviated.

BENEFITS OF THE APPROACH

Overall, OLA team members and course development staff gained a much better understanding of what is actually in their course materials and a more intimate appreciation of the relative qualities of various courses.

A major benefit of this approach is the structural consistency evident across all courses. This consistency allows the production team to use global style sheets and transformation rules for delivery in print and online environments. The increased efficiency in the production phase has provided more time to evaluate the overall quality and design of the course materials. Because a published product is produced at each stage of instructional design and authoring, the opportunities for formative evaluation and field review are provided.

No longer do these activities have to wait until the course is completed. Flexibility in relation to learner needs can be achieved through learner profiles and related alternative activities and assessments that address learner differences in terms of access, literacy level and technical proficiency.

A common vocabulary for course components and instructional design elements has greatly improved communication across teams. Instructional designers, course authors, management and production staff now have a common framework for workflow management.

Figure 4.9 illustrates the basic process of bringing a new course into an SGML/XML framework, from instructional design through to delivery in multiple media. The OLA example is used again to describe the process of structured content development using an actual example. The process is composed of four overall phases, which are decomposed into a number of incremental stages.

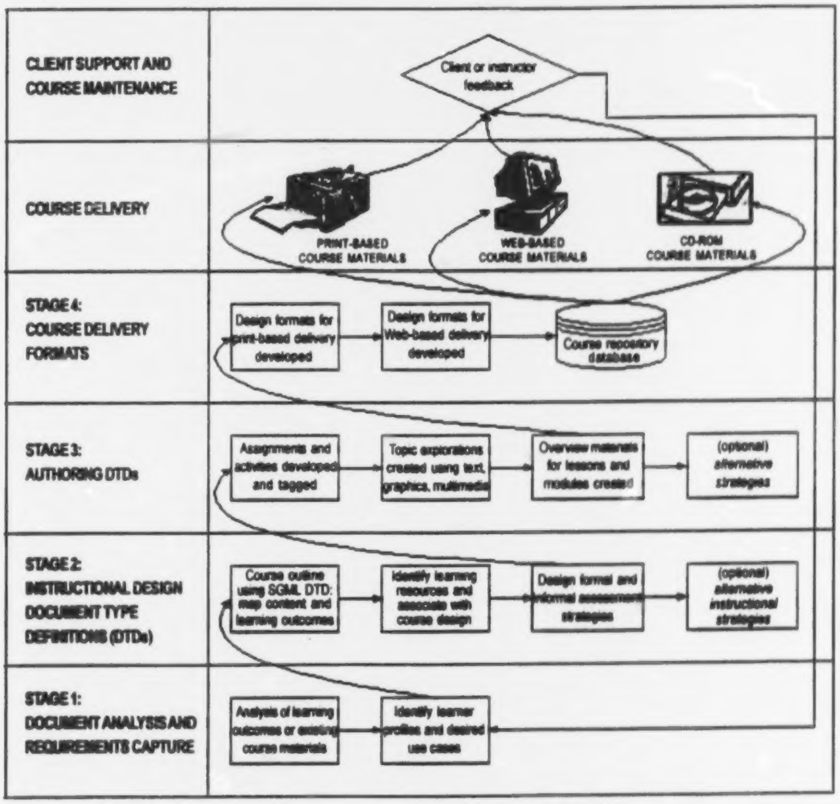
CLIENT SUPPORT AND COURSE MAINTENANCE
Client or instructor feedback
COURSE DELIVERY
PRINT-BASED COURSE MATERIALS
WEB-BASED COURSE MATERIALS
CD-ROM COURSE MATERIALS
STAGE 4: COURSE DELIVERY FORMATS
Design formats for print-based delivery developed
Design formats for Web-based delivery developed
Course repository database
STAGE 3: AUTHORING DTDs
Assignments and activities developed and tagged
Topic explorations created using text, graphics, multimedia
Overview materials for lessons and modules created
(optional) alternative strategies
STAGE 2: INSTRUCTIONAL DESIGN DOCUMENT TYPE DEFINITIONS (DTDs)
Course outline using SGML DTD: map content and learning outcomes
Identify learning resources and associate with course design
Design formal and informal assessment strategies
(optional) alternative instructional strategies
STAGE 1: DOCUMENT ANALYSIS AND REQUIREMENTS CAPTURE
Analysis of learning outcomes or existing course materials
Identify learner profiles and desired use cases

Figure 4.9: OLA Structured Content Development Process

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The Provision of Learner Support Services Online

DR. YONI RYAN

Introduction

When the University of London instituted correspondence courses in 1858, the first university to do so, its students (typically expatriates in what were then the colonies of Australia, Canada, India, New Zealand and South Africa), discovered the programme by word of mouth and wrote to the university to enrol. The university then despatched, by post-and-boat, what today we would call the course outline, a set of previous examination papers and a list of places around the world where examinations were conducted. It left any "learning" to the hapless student, who sat the examination whenever he or she felt ready: a truly "flexible" schedule! This was first generation distance education (Tapsall and Ryan, 1999): "independent" learning for highly motivated and resourceful autodidacts disadvantaged by distance.

In 2000, a reporter for the *Washington Post*, Jay Mathews, gave a bemused account of his "test drive" of an online course. After several telephone calls inquiring about course options, the adviser recommended a particular subject. Mathews accepted the advice, gave his credit card number and waited for further instructions, which did not arrive. After more telephone calls, he finally received a textbook, but no other instructions.

> So I call my enrolment adviser, Jennifer, who tells me, very politely, that I must log on to the course myself. I go to the Web site but see no obvious way to do this. I call Jennifer again. With admirable restraint, she tells me to click on the "Capella Campus" bar, then on the "Enter Online Courses" box. This works, to a point (Mathews, 2000).

The site has a list of technical requirements: Mathews discovered he needed a 28,800 baud modem, among other things. Like many prospective students, Mathews had no idea what this meant, let alone what his baud rate was, or where to locate the information. Mathews's litany of woes continued; he concluded that "filling gaps in an education is what online learning is all about right now," and interested students "shouldn't expect too much."

The difference between these two situations, each characterised by an absence of effective learner support, is not merely the technologies of delivery. It is over a century's worth of research into cognition, pedagogical methods, distance education practice and social and community expectations of what education and training can and should provide for learners, as well as the political and funding support for education that various government and non-government agencies are at any time prepared to provide to

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their constituents. Mathews' dilemma can, of course, be attributed in part to the newness of Internet-based or virtual education and, indeed, of the Internet itself as a vehicle for service-type transactions. It can also be attributed to students' inexperience in asking the right questions and not knowing the answers to seemingly obvious questions, like their baud rate. The online student at a distance has little recourse to anyone except the institution's staff, unless he or she has net-savvy friends.

However, in considering the nature of online student support services at the turn of the millennium, it is important to recognise that a multitude of factors other than technology are in play. Such factors will determine the decisions of policy-makers and managers as they seek to capitalise on the potential of the Internet for education.

Notwithstanding the enthusiasm of many in the communications and information industry, and bold predictions by champions such as Cisco Systems' John Chambers that "education is the next killer app. of the Internet," we are far from having absorbed this new medium into our tools of trade in education in the way that we have absorbed print.

This chapter explores:

- The nature of learner support services in distance education.
- How online technology is affecting learner support, and how services are developing in terms of form and content, in different geographical regions and in the various sectors of education.
- The driving and constraining forces affecting the provision of such services.
- The major policy and practice issues that decision-makers in all education sectors must confront in relation to online learner support.

Learner Support in Distance Education

A BRIEF HISTORY OF LEARNER SUPPORT

We cannot consider the nature of online learner support services in distance education without some understanding of the development of learner support in general.

In a face-to-face classroom in a simple education system, learner support is the provenance of the individual teacher. Teaching and learning occur through direct instruction, from one to many (the "class"), in a physical space which might contain other physical resources such as maps or books, designed to supplement the teacher's knowledge and extend student learning within a defined and constrained curriculum. There is limited opportunity for serendipitous or non-prescribed learning. Depending on the wealth of the system, students also have access to a more-or-less well equipped library. The inevitable record-keeping is handled by administrative staff in the office, who maintain a physical filing system consisting of individual student records and the prevailing regulations of the system. A public library might be available to supplement the school resources. The teacher in such a system rarely differentiates between direct instruction in a knowledge domain and support of his or her students: for example, he or she may give tips on scheduling study, or mnemonics which assist in rote learning tasks, or advice about career choices and further education opportunities. Learner support comes in the *person* of the individual teacher or administrator.

As educational systems become larger and more complex, the various roles of the teacher and administrator are shared among other specialised professional roles, such as that of teacher-librarian and academic counsellor. The teacher may remain a primary locus of support, and indeed is expected to be so, but learners have recourse to services in the form of professional staff and resources collected for their benefit.

Such a system implies that two forms of learner support are necessary: one related to development of the individual's potential and another related more to the needs of the system for accountability, although these obviously intersect in a society which values certification of an individual's achievements. Moreover, there is no doubt that students' perceptions of their learning environment, and indeed their learning itself, is heavily influenced by the efficacy of the administrative aspects of that environment.

Yet even in our simple classroom, there is a third layer of student support, a motivational element, provided in the form of the class group, although the degree of motivation depends to some extent on both the psychology of the individual and the social dynamics of the class. The importance of this third layer of support cannot be underestimated. It lies behind the strong preference of most post-secondary students for on-campus education, and even the stated preference of many external students for class contact (Scriven and Ryan, 1993). It lies at the base of the standard distance learner's plaint "the loneliness of the long distance student" (Besser and Donahue, 1996; Brown, 1996; Li et al., 2000). It is also of course, the prime reason for gathering students in classes at all — to provide a socialising, civilising experience where individuals learn how to behave in groups and how to negotiate "community." Governments and society at large are committed to this social and nation-building aspect of the educational experience; hence their consistent preference for investment in physical educational infrastructure at primary and secondary school levels and for the traditional school-leaver at undergraduate level, whose education is as much personal as vocational.

A further significant factor is the growth of learner support services. In developed economies at least, the late 20th century saw a swing away from the teacher-centred model which had characterised education. Pedagogical and social theories favoured a new "learner-centredness." In Dewey's (1929) conception, this involved attention to the development of the personal potential of each student, according to his or her talents and ambitions. However, learner-centredness has since segued into learner responsibility. Whereas Dewey conceived of the teacher manipulating the learner's environment and resources in order to stimulate the individual, by the end of the century, the learner was to be independent of the teacher, who was no longer a directive expert or "sage on the stage," but a facilitator, or "guide on the side." The learner was presumed capable of and committed to the pursuit of knowledge. Further, the explosion of knowledge in the late 20th century meant a greater emphasis on the process of learning, rather than on the content, which is, it is widely argued, rapidly superseded.

This pedagogical theory of learner-centredness coincided with another trend: the "commodification" of educational provision as a service industry (Ritzer, 1998) and the emergence of for-profit educational organisations, with a consequent emphasis on students as clients and customers. For-profit providers stressed not only the employability of their graduates, but also their level of "service" through attention to administrative ease, pre-enrolment advice, career days with prospective employers, streamlined enrolment and credit card payments. Traditional providers in all sectors had rarely considered such services important to their student base. Competition among providers has changed that attitude over the last 10 years, in North America and Australia in particular, as on-campus and traditional providers discovered the niche market of adult learners, who have little time or patience for queues and delay.

The major technical change of the last 20 years is, of course, the phenomenal increase in computer power and the associated development of equally powerful software applications. These applications have made record-keeping and learning management systems possible through relational databases; encryption devices have enabled students to directly access an institutional system with relative security. The 1980s saw the emergence of the Internet as a communication device with the ability to manage both real time (synchronous) and delayed time (asynchronous) interactions and one-to-one and one-to-many communication, an obvious boon to distance education.

Over the 150-year history of distance education, practitioners and managers have made variable progress in systematically addressing the issues of supporting their learners through various means: improving the quality of print materials in terms of physical presentation; devising instructional design processes that involve both "content experts" and "learning experts"; implementing borrowing policies that maximise student access to resources while minimising student mail costs; establishing student support centres where local tutors assist both face-to-face and by telephone. Specialist distance education administration units have been established to deal with the inevitable problems facing the distance and adult student: inability to meet assignment due dates, lost assignments, enrolment and contact with the teacher. Design teams develop learning materials that aim to promote "active learning," to replicate in some sense the dialogue that Laurillard (1993) argues is essential to the learning process.

In institutions with a distance education mission, learner support has involved systematic investigation and research into how students can learn in a non-classroom environment, how best to substitute for the informal and incidental learning that occurs on campus and the vast range of what Rumble (2000) calls "consumptive service benefits." Guidelines have evolved. The Commonwealth of Learning, for example, has published a toolkit, "Learner Support in Open and Distance Learning" (see www.col.org/newpub.htm). However, our knowledge about what services may assist our students is often outstripped by a system's capacity to provide these services, as Rumble (2000) quoting Tait, observes.

To summarise, the last decade of the 20th century has seen an extraordinary confluence of forces — technical, pedagogical, ideological, economic — which have stimulated the growth of distance education, particularly in terms of "supply," and particularly in North America. These forces have increased the potential of distance education systems to overcome many of the disincentives to off-campus study, especially through providing social learning opportunities and immediacy of access to resources, both human and digital.

THE NEED FOR LEARNER SUPPORT IN DISTANCE EDUCATION

Off-campus study has never enjoyed wide popularity as a mode of education. In the Australian higher education sector, despite being long-established as an alternative access mode for those disadvantaged by distance or circumstance, distance enrolment remained relatively stable as a proportion of the total enrolment in higher education, at 10% to 12% between 1989 and 1995 (Cunningham et al.,1998). After fees increased in 1998, the number of mature students and part-time enrolment increased. This corresponded with a sharp upsurge in distance enrolments to 14% in 2000, which was affected by the Asian financial crisis (which discouraged many students from the more costly on-shore education). Distance enrolments among Australia's Vocational Education and Training (community college level) students remain at 10%. It was reported that between 1989 and 1999, there was a 800% increase in Australia's international distance enrolments, with international students constituting nearly 10% of all external enrolments (Dobson and Sharma, 2001). The same report observes that failure rates among traditional school leavers are twice those of mature students in distance mode.

For an increasing number of students, it is obvious that distance learning is a convenient option, or the only possibility for gaining an educational qualification. Yet the attrition rate remains high, certainly much higher than the 17% drop-out reported from all U.K. universities (Dobson and Sharma, 2001). Potter (1998) reports a 75% non-completion rate at Athabasca University, a wholly external provider with an excellent reputation that uses mainly print. But for the U.K.'s Open University (UKOU) , Potter quotes a Bates 1989 study on non-completion that show numbers between 25% and 50%. The difference is attributable to a much stronger support network, including face-to-face tutorials and assigned telephone tutors at UKOU. Daniel (1995) reports even higher attrition in the "mega-universities" of Asia: the Korean National Open University had a dropout rate of 90% at the time of his study. Belawati gives the figure of 95% for the Indonesian Open Learning University (Belawati, 1998).

Few providers, public or for-profit, are reporting their attrition rates in wholly online programmes. However, Laing (2000/2001) quotes Elliott Masie's figure of 10% completion in the U.S. and Evans (2000) states that SkillSoft, an online training specialist, confirms a high attrition rate in the U.K. Trotter (2001) reports a 50% attrition rate in U.S. college-level online programmes. It is noteworthy that successful students in the University of Phoenix online programme reflect the social correlates of "connectedness" in the U.S.: they come from a high socio-economic group, are primarily male and are already attuned to a networked environment through their work place (Cunningham et al., 2000). This suggests a real challenge for online education in other than advantaged groups.

Clearly, we owe it to our distance learners to devise better support services and to avoid both the personal failure of students and the economic costs of wastage to the institution and the wider society. If online programmes are registering poor completions, institutions must increase their attention to learner support services rather than focus simply on providing technological infrastructure, as they have done to date. We must aim for the provision of services which are appropriate to the external cohort we are serving, while recognising that we should not attempt merely to replicate on-campus learner support services via technology. Distance learners have different needs from their on-campus colleagues, and this difference must be recognised and accommodated, while the potential of new technologies to support distance learners should be exploited where feasible.

Defining Learner Support Online

At present, much of what is provided in the form of learner support is systems-driven rather than student-centred. For example, Inglis et al. (1999) briefly explore three service areas: the helpdesk (both technical and academic), the library and counselling. EDUCAUSE's criteria for the Award for Systemic Progress in Teaching and Learning 2001 advises that applicants must give evidence that the system is learner-centred, but there is no explicit mention of student support (see cause-www.colorado.edu/awards/tl/tl.html).

Allen (2000) notes that a scan of online courses indicates that most are information heavy. Text is "shovelled" online, with embedded links to other resources, without any understanding that use of the Internet is a "socio-technological practice." We need to envision it as not merely a tool, but as "constitutive of the educational experience itself or constituted *by* educational experiences." This aligns with the argument by Hannafin et al. (1996) that changes to cognition cannot be understood "when the individual or the technology are considered apart." Too often, virtual education has been approached as a technical solution to distance, without considering that, for the student, the nature of the educational experience is a function of the opportunities for thinking and learning that the institution might provide. For many students, the technology is the least important aspect of their learning, if not a disincentive.

Such considerations also raise the inevitable question of the degree to which learner support online for truly distance students (defined as students who rarely if ever experience an on-campus class) differs from learner support online which complements or supplements face-to-face teaching. The distant student cannot easily borrow texts from the campus library, make a low-cost local phone call or take a faulty computer to a repair shop. Too often, developers of online materials assume that what works to complement and extend class-based teaching will open new markets at a distance, where online provision constitutes the entire educational experience.

How then might we define appropriate online learner support services for the distance student? We should, I suggest, begin with the learner and his or her expressed needs. For Potter, student support in distance education:

> ...includes the many forms of assistance that are designed to remove barriers (situational, institutional, dispositional, and informational) and promote academic success. Examples of such services are pre-admission counselling, academic advising, financial aid, learning skills instruction, child care and much more (Potter, 1998).

How much more? Potter suggests a learner-centred model that begins with a thorough investigation of the critical aspects that affect students' disposition to distance education, inhibiting factors to enrolment and progress and the positive motivational aspects of their learning experience. Her Canadian study (which was not confined to online students) indicates that students' initial experiences were the most significant factors in their experience of distance education.

Rumble (2000) broadly confirms this and Potter's other findings. Pre-enrolment information and advice rated highest in her population: specifically, accessing information about specific programmes rated highest, followed by general information about distance education opportunities, the opportunity to speak with the teacher (not an administrator), textbook procurement information, advice on course selection, orientation to the library/learning resources, and help with the application process. Potter's respondents stressed the critical services that universities should provide:

> ...high-quality materials designed specifically for distance and sent out in time for the beginning of the course [and] access to the instructor, largely for feedback and encouragement. Next in significance were streamlined administration procedures, such as accurate information, registration systems that work, returning calls promptly, and "one-stop shopping" (Potter, 1998).

However, Potter concludes by cautioning that not all services were expected — or utilised — by all students, that adult students are diverse, and hence institutions "cannot simply plan for the majority" (Potter, 1998).

Potter's study is limited by her survey demographic: a relatively traditional distance education population of North American adults, mainly female and already well-educated. There is clearly a need for further research into individual institutional populations, especially since Internet-based courses deliberately target a new demographic of lifelong learners, those seeking the qualifications now demanded by a wired world and a shrinking manufacturing economy. In the U.K., for example, the University for Industry (UfI) is predicated on the use of the Internet to enhance workers' skills for the knowledge economy. A Marchmont Observatory report argues that learner support is "crucial to the success of the UfI learning model," especially since non-traditional learners are likely to be discouraged by learning in the unfamiliar medium of the Internet (Evans, 2000).

In other regions, student needs may differ in emphasis from those reported by Potter's respondents. Learner support in developed economies differs vastly from what is expected and can be provided in less wealthy economies. For example, the provision of child care centres on campus for students is now taken for granted in many Western institutions, even in some secondary schools, yet may neither be needed nor possible in most non-Western countries. Belawati (1998) reports that "payment flexibility" was as important to Universitas Terbuka students as counselling, tutorials and feedback, and also that counselling and tutorial support might be more critical to Indonesian students than to students in systems which fostered independent learning skills.

Even on-campus online students unfamiliar with the Internet environment face problems which, as Hara and Kling (1999) note, have rarely been subject to "systematically empirical or critical study." Their research, conducted in a major U.S. university, revealed that technical problems predominated, especially for those without access to computer support or who lacked computer skills and for those who relied on on-campus laboratories for access. Lack of familiarity with the equipment and the nature of online searching left students frustrated with the long hours spent attempting to fulfil assignment requirements. A second major frustration lay in the "lack of immediate feedback from the instructor and ambiguous instructions on the Web and via e-mail" (Hara and Kling, 1999). It appears that Internet instructors and designers have to learn anew the very language in which they communicate, since the medium encourages hasty responses. Many online instructors, without distance education experience, have not learned the critical nature of clarity and explicitness. This is not the case in the classroom, where ambiguous messages relayed by a teacher can be immediately "corrected" when the puzzled expressions of students are noticed.

Such difficulties illustrate how much successful learning depends on specific teaching skills in the online environment, and they raise the issue of adequate professional development — and time — for the Internet teacher. Learner support becomes more visible in the teaching process itself. Technical support is clearly critical, as is some degree of familiarity of the teacher with the systems being used, since student frustration (and attrition, as the Hara and Kling (1999) study shows) rises when students are simply referred to technical support services.

If online education is to fulfil its promise for distance education, it must clearly focus on providing quality learner support services which meet the particular learning needs of the institution's students. It must also acknowledge that these needs will be compounded by distance and a new medium of delivery, one which brings additional support needs in both instructional methods and technical skills.

Providing informational needs is relatively easy: most educational institutions already make much of their documentation available online. However, providing handbooks and course descriptions online is clearly far from sufficient. Nor can an institution simply provide e-mail packages and bulletin boards and expect students to master and enjoy this new form of learning. Distance educators utilising new technologies need to understand Sennett's observation that "it takes institutions a long time to digest the technologies they ingest" (Sennett, 1998). We could make the same observation about those who work and study within institutions.

Form and Content of Online Support Services

Potter's study, plus the Hara and Kling research, provide a learner-centred framework for the form and content of online support services, beginning with information about the opportunities distance education can offer.

PRE-ENROLMENT

For the potential student, there are any number of commercial and agency sites, such as Hungry Minds (www.hungryminds.com), the Globewide Network Academy (www.gnacademy.org), or Distance-Educator.com (www.distance-educator.com/about.html) that extol the virtues of e-learning and provide a database of distance and online courses and programmes. However, not all their links are to accredited providers, and it is often unclear if subject enrolments in commercial programmes attract credits to fully accredited providers. The notorious case of Greenwich University in Hawaii and Australia (Ryan, 2001) as well as the activities of other unscrupulous operators (see www.virtualuniversities.net) demonstrate the need for an authoritative listing of accredited online providers, and the nature of the qualifications gained, including their acceptance in other jurisdictions.

At the next level, Potter's students wanted information about the range of courses available. This would suggest not merely the usual brief description of a course and its potential benefits in terms of career opportunities, but all subject requirements, their sequence, any limitations in their offering, the nature of their delivery and the support mechanisms students could expect. Most institutions are weak at providing such details in on-campus study, where informal communication between students, and between students and staff, substitutes for "hard information." For the prospective online student, these tacit knowledge sources are unavailable, so they have to be made explicit online *and* via telephone support. Jay Mathews's constant recourse to telephone advice shows how important this element is, along with embedded e-mail links to an inquiry service. The University of London external programme (www.lon.ac.uk/external) has such links, along with an automated response for out-of-hours inquiries. It also has a frequently asked questions (FAQ) page, although this is limited in scope. The UKOU (www3.open.ac.uk/openings) provides a good practice example of information at the course level.

For most prospective students in distance education, the next questions are "Can I do it?" and "What will it entail?" Since distance education requires strong self-motivation and independent learning skills, pre-enrolment support ideally would include a checklist to help students decide whether this is an appropriate modality for their circumstances and learning style. Several providers have rudimentary self-assessment tests that are designed to help students realistically appraise their capacity to undertake an online course. Examples are at the Keller Graduate School of Management's site (http://online.keller.edu/index.real?action=ss&subaction=forme), and the University of Phoenix's site (http://online.phoenix.edu), which give a brief explanation of the online process.

Learning style preference checklists are useful to the prospective distance student: the student who prefers to learn through reading and reflection is likely to prefer print-based modes, even if they are delivered online, over a video-based course, for example. Checklists should also include a nominal weekly time commitment for each subject. For-profit organisations currently excel in allowing students to "taste test" individual subjects online, even where they do not provide a checklist. However, Learndirect, the network of the UfI, suggests prospective students "dip into our tasters for a flavour of the learndirect experience" and offers a wide range of different subjects for sampling (www.learndirect.co.uk/home/get_started).

At this stage, it is also critical to provide details of equipment requirements, indicate the costs of purchase and ongoing connection, clarify the technical skills levels required and indicate the level of technical support provided. Had Hara and Kling's (1999) students been informed that they had to know or learn HTML, they may have decided against enrolment, taken a preparatory course or accepted HTML as another learning objective of the subject. Students should also know whether the institution provides subsidised ISP services, and whether Internet access attracts a long distance or local call charge.

Potter's students also wanted ease of textbook purchase, and there is strong evidence that in this requirement at least, many institutions excel, since online book orders reduce provider costs and are therefore an attractive proposition. However, information about library resources and costs appears to be less well-handled. The University of Phoenix is exemplary here, although it has the advantage of a restricted curriculum which is largely confined to contemporary knowledge, where online resources are often sufficient. It informs prospective students (http://online.uophx.edu/default) that courses are supported by a digitised library service to relevant publications, and it even allows alumni continued access to those resources. Institutions with a wider remit of programmes should provide links to local public libraries and indicate what, if any, borrowing arrangements can be made with other library services.

Since distance education of its nature is an out-of-hours activity, telephone and e-mail help desks with restricted hours are not helpful. Several institutions have developed imaginative solutions to the budget blow-out that is likely to result from a 24-hour service, the ideal if online provision is to fulfil its promise of "anytime, anywhere, anyplace" learning. For example, Macquarie University in Australia and the London School of Economics have partnered to provide a 20-hour help desk, without adding to institutional cost, by utilising the different time zones between the two institutions to provide coverage of each other's students. USQ*Online*, where fee-paying units are serviced by a commercial applications service provider (ASP), NextEd, provides all-hours support for technical and connection queries by routing e-mails to employees in different time zones in its Asia-Pacific-West Coast, U.S. workforce. (USQ's home page, incidentally, scrolls the message that "all systems are working normally," which is useful for off-campus students whenever the server is down, although this message is featured on the home page only, which may not be the student's log-on page.) If immediate all-hours responses cannot be logistically provided, an automated response should give a guaranteed service level that the query will be attended to within 24 hours.

Tuition fees and any available financial aid are also critical information, although distance part-time studies do not qualify in most countries for aid. However, some institutions (e.g., USQ*Online*) are currently offering scholarships to induce students into fee-paying online courses, and details of these should be available online.

Most institutions have invested heavily over the last three years in the infrastructure of their online systems with varying degrees of success in integrating student management systems, instructional support systems such as library databases and course content and communication systems. Network platforms that support student-teacher communication and student-student collaboration, chat rooms, bulletin boards and the library have generally had priority, as the Computer Supported Intentional Learning Environment (CSILE) network project at the Ontario Institute for Studies in Education demonstrates. But the urgent need is for an electronic "one-stop shop" for the individual student which provides transparent links to the many servers carrying different systems. Distance education providers must embrace e-commerce solutions to payment and admission procedures. Indeed, many vendors which began as ASPs providing optional institutional service levels (from basic server space and a teaching template through to professional development for faculty, student record systems and individualised design and development services) have seen the advantage of adding an e-commerce strand. (Blackboard, for instance, has recently acquired debitcard, to integrate and facilitate payment software into the company's student management and teaching applications.)

At the pre-enrolment stage, it is also critical to provide telephone-based course advice by well-experienced academic advisers. One of the difficulties reported by Western Governors University (WGU) in their call centre operation, was that they employed poorly educated staff who had not themselves been to university and who did not, therefore, understand the nature of callers' questions (Cunningham et al., 2000). Further, they were paid on a time-on-query basis, inappropriate to the very specific and detailed queries they received from students concerned about investing their educational energy and dollars wisely. The WGU experience also suggests that students do not read a mass of Web site information: "They'd rather ask questions and talk to you" (Taylor Straut, quoted in Cunningham et al., 2000). Automated systems based on intelligent databases for this inquiry level are still under development (Taylor, 2001); whether they are useful for the sorts of questions students have remains a moot point.

It is at this pre-enrolment stage that commercial providers like the University of Phoenix (UoP) excel in another element of support service which is generally handled poorly in the public sector: credit transfer. UoP, with its mission to provide convenient and speedy qualifications for adult workers, has generous credit transfer arrangements for prior learning in a variety of organisations, especially the military services. Credit transfer calculations for many organisations and subjects can be made online. UoP has also devised a software programme which calculates credits and equivalences, including those obtained in some overseas countries, and they inform students of the results in one-third of the time taken by the American Council on Education and at much less cost to the student (Cunningham et al., 2000).

Some individual institutions at the post-secondary level have also developed prior learning assessment (PLA) procedures, but these are generally limited to assessing outcomes rather than formal courses. For example, British Columbia's Open Learning Agency (OLA) has a rather complex Web site (www.ola.bc.ca/pla) devoted to helping potential students determine how to claim credit via a number of modes: portfolio development, challenge examinations, assignments, etc., as guided by an adviser. Candidates are warned that credit claims often take several months to substantiate and require payment by the student, despite being subsidised by the B.C. government and universities. The amount of payment is not fixed and must be estimated by the adviser; it is not subject to financial aid provisions, and fees must be borne entirely by the student. The B.C. government intends that all post-secondary institutions will eventually have systematised PLA to enhance lifelong learning opportunities.

OLA itself is sponsoring such a move through the auspices of the Canadian Learning Bank (www.ctt.bc.ca/k2000/Registry/ola2.htm), which is establishing an evaluation service for overseas credentials, as well as a credit review service designed to assess work place-based learning for transfer into accredited programmes (www.learningthatfits.com/credrev.htm). A U.S.-based organisation seeking to facilitate PLA is the Council for Adult and Experiential Learning (CAEL, www.cael.org), founded by Educational Testing Services in 1974 as a vehicle to encourage portfolio development to demonstrate competencies and skills.

What is clear from examining institutional Web sites is that pre-enrolment support is patchy at all levels. While most institutions have designed graphically attractive home pages, navigation to important information for pre-enrolment is often difficult, since it is rarely designed from the user's perspective. On some sites, even the most fundamental design principles are ignored: back buttons do not work; pages of text are displayed with no exit or back-to-menu option; and vital information is buried several layers down, almost guaranteeing prospective students will abandon their search.

POST-ENROLMENT

After enrolment there also appears to be wide variations in the support services necessary to increase student satisfaction with the learning experience. Online enrolment should be possible and should immediately generate further information on subject content guides, suggested study schedule, learning resources required and recommended, contact names of teachers and tutors and their qualifications, and details of who developed the materials if the developers differ from the teacher.

Orientation to the particular systems of the provider are essential at this point, and many institutions are now finding that at least one face-to-face session in information literacy skills and basic computer access is necessary for online learning. UCLA's for-profit continuing professional education arm, OnlineLearning.net (OLN), has a mandatory online orientation programme for new students to ensure basic competence with course software. Gunawardena and Duphorne (2000) also argue the importance of practice with listservs and e-mail before the subject proper starts. Alternatively, for relatively confident users, a self-paced module to assist in accessing online resources should be provided, along with a module in independent learning skills and time management. Although most research in this area (e.g., Rossiter and Watters, 2000) suggests that such skills are best learned in a subject specific context, and hence integrated in the subject materials, there are information retrieval skills which can be taught independent of particular knowledge domains. Library services are crucial to external students, and the mere provision of access to databases and catalogues often represents only a tantalising glimpse of what might be available — if it were online. A reference librarian available in real time as a distance student is searching would constitute an excellent support service.

Following Potter's students' desiderata for successful distance learning, constructive and timely feedback from the teacher appears a fundamental support service (though it should be a routine teaching method). Continuous communication and contact between students, and between students and staff, is critical in all cultural contexts, as Daniel's (1995) work on the mega-universities makes clear. (See also Shin and Kim, 1999 and Belawati, 1998.) This suggests that the commercial vendors who tout the cost-effectiveness of virtual education for thousands at little marginal cost are deluded, at least until automated response systems are routine and affordable. Certainly the more serious online providers such as UoP and OLN, work on ratios of 9/10:1 to enable close attention to individual students and constant encouragement and feedback. UoP's pedagogical philosophy is predicated on collaborative learning and a Vygotskian principle of social group motivation, even in their on-campus courses. Hence classmates will progress through a programme together, and students are expected to "meet" (virtually or physically) once a week outside their online times to provide their own group learner support. Frequently asked question (FAQ) pages, non-curricular and curricular chat rooms and class conferences provide essential support. Yet it is apparent that the teacher plays a critical role in explaining and demonstrating and that a virtual environment requires a different mindset for learning, one that does not always demand an "expert" teacher-answer to every question, in the same way as on-campus students explore concepts and clarify misunderstandings together.

Indeed, the importance of this communicative aspect of the learning process may be reflected in the University of Southern Queensland statistics which reveal that 70% of their hits are for communication, not content pages. (See also Hutton's (2000) experience at the Open Polytechnic of New Zealand.)

Obtaining texts and other resources was an issue of concern to Potter's survey group, as it is to all distance students. Current copyright laws limit access to many texts online, although many institutions such as Queensland University of Technology are developing limited digitised collections in some areas under licensing regulations. Other agencies have developed fee-based regimes to assist distance learners, such as UnCover, the Colorado Alliance which has a document delivery service.

One further software development will ultimately prove of particular use in learner support: the learner management systems which are beginning to be fully integrated with information systems (Bosanquet, 2000). There are two forms of these. The first (and most developed because of its commercial returns) links student records with current subject study and assignments, allowing students to track their grades and learning activities, payment and loan records, and institutional administrative systems in a seamless interface between student learning and institutional systems.

The second and potentially more revolutionary system is in the form of a dossier of all an individual's learning activities over a lifetime, whether formal or informal. This has been termed a "knowledge management system," somewhat tangential to the notion as it is proposed by the Organisation for Economic Co-operation and Development (OECD, 2000). OECD conceives of knowledge management as a systematised approach to sharing (tacit) knowledge in educational systems through using the potential of ICTs to enable networking within and without educational institutions, to "open" education to all organisations in the knowledge economy. In the present context, however, the term is used in a more specific manner to designate the compilation and recording of an individual's suite of learning activities across all life contexts.

Such a system supports the notion of lifelong learning, through recognising prior learning, and encourages a greater articulation into formal learning programmes. It encourages challenge tests to ensure knowledge and skill competencies, thus eliminating the need for lockstep cohorts and repetition of study. The promise of learner management systems is dynamic, interactive and personalised learning tailored to the individual's needs and, at best, to the individual's personal learning style. In conjunction with the emerging potential of metatagging (see Chapter 4 in this volume), it would allow students to combine and choose topics of study at a modular or topic level.

However, the prospect raises serious philosophical and pedagogical questions: Can education be equated with competence and skills only? Are there other values embedded in a curriculum that cannot be tested at the performance level? To what extent should students be able to choose and minimise their exposure to a (presumably integrated and holistic) curriculum?

POST-GRADUATION

As tertiary education institutions transform themselves into businesses, alumni loyalty or "stickiness" has entered the educational lexicon (Rumble, 2000). This suggests both e-business and e-commerce uses of new digital technologies in order to encourage graduates to contemplate continuing professional education and leisure learning with a particular institution, as well as donations to the institution. For distance students, the services could include employment links and opportunities, as well as continuing access to library resources and discounted ISP services.

STUDENTS WITH SPECIAL NEEDS

Distance education has historically provided for students with special needs. We must mind Potter's observation that many individuals have special needs during their learning experience.

One of the emerging issues for online educators at all levels is the accommodation of different forms of disability. Countries vary significantly in their legislative provisions for disabled access, and even disabled facilities on campus are relatively new. The U.S. government has only recently mandated that government Web sites must be accessible to the blind and mobility impaired; for example, sites must allow keyboard navigation for those unable to manipulate a mouse, and read-aloud software must be installed for blind users. The UKOU also has a concerted equity programme: it provides captions on videos for hearing impaired students, transcripts of audio cassettes, and its learning centres are equipped with screen magnification devices on computers. However, there appears to be copyright difficulties associated with reproduction of some sites via assistance devices, as this constitutes redigitisation of materials, a situation which must be addressed if disabled students are not to be disadvantaged.

General Web site design principles are useful (see those on the World Wide Web Consortium (W3C) site www.w3.org/WAI). Test sites for evaluating usability are available, for example at www.cast.org/bobby. Other agencies have developed extensive guidelines specifically for educational institutions seeking to facilitate learning by the disabled and other equity groups. For example, the needs of English literacy learners in Australia and Aboriginal and Torres Strait Islander populations, are addressed at www.flexiblelearning.net.au/accessequity, which outlines particular design features that assist target learner groups and provides translation tools for non-English speaking background students (NESBs).

Disability interest groups such as the Blind Citizens Australia (www.bca.org.au) have made much progress in producing appropriate principles for access to online educational provision; these are comprehensively superior to most general guidelines on enhancing educational institutions' provisions for students with disabilities. Further guidelines are collected under www.makoa.org/web-desi.htm. Individual universities also list guidelines, such as the University of Newcastle, at www.newcastle.edu.au/access.

Few institutions have made much progress in online support for personal counselling and health services, although Indira Gandhi National Open University (IGNOU) apparently offers a chat mode or e-mail service (Sharma, 2001). Some have placed health and safety regulations and guidance online, and student guilds and unions often provide links to authoritative (or opinionated!) sites for generic guidance on sexuality, financial planning and cheap meal preparation. As an interesting aside, Arizona State University offers a distance education programme for the parents of its first year on-campus students, providing online lectures, weekly assignments and chat rooms to help parents help their student children adjust to living and studying away from home.

Nevertheless, even telephone counselling is challenging for distance providers because of the absence of visual clues to behaviour and state of mind. The economics of such a service are often prohibitive. Cost pressures in the last decade have forced UKOU to abandon its personal tutor-counsellor support for a call centre advisory service which relies on a student management database rather than personal knowledge of the student (Rumble, 2000). Distance operations should forge links with community groups and health services within their students' localities. Finally, for all students, and in all course materials, there must be a clear and systematised recourse for complaints and problems — the online equivalent of the emergency button. It is too easy for students to slip through the increasing number of cracks in a system which has added technology to the education loop that is administration, teaching and resources.

GUIDELINES FOR ONLINE SUPPORT SERVICES

A number of large research projects have already compiled guidelines for institutions and individuals working in distance education modes, although these are largely confined to post-secondary contexts at present, and most are U.S. in origin. Many of these cover a broader canvas than learner support; see, for example, the American Federation of Teachers "Distance Education: Guidelines for Good Practice 2000" (www.aft.org). Development of such guidelines is exacerbated by the unsteady state of software development, as new versions and applications emerge constantly, a factor which has undoubtedly contributed to the decision by the Western Interstate Commission for Higher Education (WICHE) to remove their excellent guidelines from their Web site during 2001. Once universal technical standards are established, as they have been, for example, in the telecommunications industry, the situation will be somewhat easier. But such standards are some time away, notwithstanding the exemplary work of the EDUCAUSE-sponsored IMS project. Moreover, interoperability standards cannot be extricated from other complex issues such as management of intellectual property rights (Bosanquet, 2000), and IMS is but one of a number of international bodies working in the area of international standards for education.

The premier set of principles at present is that available from WICHE at www.wiche.edu/Telecom/resources/publications/guide/guide.htm. It comprehensively lists good practice principles and links to exemplars in the broad areas canvassed in the schema outlined in the sections above on pre-enrolment, post-enrolment and post-graduation. The WICHE guide is of particular assistance because it links directly to exemplars in a wide variety of institutions, mostly of course, U.S.-based.

Other guidelines of note include those established by the Scottish Qualifications Authority (SQA, 2000), from which the UfI framework is derived (Evans, 2000); here the focus is on tutor training specific to the online lifelong learning context. The American Council on Education has also published *Guiding Principles for Distance Teaching and Learning* (www.acenet.edu/calec/publications/htmlinciples.html) although these are general and oriented to teaching staff rather than to whole-of-institution support services. The Institute for Higher Education Policy has a 2000 report "Quality on the Line: Benchmarks for Success in Internet-Based Education," partly sponsored by the National Education Association, with six best practice institutions featured, and 24 benchmarks to ensure quality (www.ihep.com).

There would seem an urgent need for a Web site similar to WICHE's, updated regularly, with exemplars drawn from a worldwide range of institutional settings, so that developing countries could locate examples more appropriate to their contexts.

For those seeking practical advice on migrating a culture and an institution towards online support services, Brigham (2001) has an excellent case study of how Regents College (now Excelsior College) addressed structural, management and resource issues in its conversion programme. Although Brigham unfortunately conceals some costs due to commercial-in-confidence considerations, the case study provides some hard figures for institutions; most usefully, it also details the processes and issues behind decisions to outsource or develop particular services in-house, such as library resources and hosting of the Web site. As yet, Excelsior has not been able to ascertain whether the provision of such services has a positive correlation with student satisfaction and student progress and achievement. This is clearly an urgent research priority.

ONLINE ACCESS

Virtual education is, of course, predicated on access to a computer and having an online connection, and even in developed countries, this cannot be assumed. Stanford's Institute for the Quantitative Study of Society (2000) reports that even in the U.S., which has the highest rate of domestic connection, only 38% of the population is home-connected, and that rate is strongly racially related, with Hispanics and African-Americans far less likely to have home access. This statistic suggests that urgent government and business investment in public learning centres, as argued by Naidoo (see Chapter 2 of this volume), and subsidised private ownership, are necessary.

Examples of business investment to enhance the skills of their workforce as a learning organisation are few: in Finland, the practice is common, and in the U.S., Ford and the United Automobile Workers Union have forged a programme to provide every Ford American employee with a free personal computer and low-cost connectivity.

But outside the developed world, such schemes are unlikely, and public provision is more feasible. The World Bank has outlaid U.S.$20 million since 1997 to establish distance learning centres in developing countries; these have Internet capability through landline connections where possible, or digital satellite equipment. They must be managed by local agencies to ensure some degree of "ownership" of the service, and, like the ICT Centre in Maseru, Lesotho, they are intended to be self-sustaining examples of private-public collaboration. However, access to a basic computer and Internet connection remains a major inhibiting factor for online distance education in most undeveloped economies.

REGIONAL SERVICES

Online educational initiatives in the main appear to be confined to particular institutions and local projects, although the African Virtual University intends to cater to continent-wide distance education at all levels. Such embryonic projects suggest both potential structures and services, and the problems that must be overcome before distance learning via the Internet becomes a reality.

The Virtual Library Support Facility (VLSF), based in Nairobi, Kenya, channels resources from the African Virtual Library Initiative in an attempt to put all sub-Saharan African libraries online by 2010. It offers a hosting facility for library catalogues and digital publications. However, the challenges cannot be underestimated. Smith (2000) reports on a project to design and implement a wireless rural network of telecentres in South Africa through school clusters. His project is based in a remote area of Kwa Zulu Natal province; of the 71 cluster schools, only three had electricity, none had telephones, and they had no spare funding for telecommunications infrastructure. Smith managed to connect two schools via a combination of satellite Internet broadcast and a radio network, but he concedes that constructing such infrastructure requires not merely a technical and funding solution, but negotiation within a difficult social and political climate.

By contrast, India appears to be leading the non-Western countries in the development of software applications generally, and in relation to online education, following a determined national ICT policy (www.nasscom.org) with a heavy education emphasis (Sharma, 2001). IGNOU is the major external higher education provider, and while 80% of its materials are print-based, in 2000 it launched its first wholly online bachelor's course in ICT, along with an Advanced Diploma in ICT, and Web-supported subjects in its M.B.A. and management continuing professional education courses (www.ignou.com/index.htm). It is recognised that Web-based delivery cannot yet replace print modes, but for those with the requisite skills and access, downloading course materials obviates chronic problems with late receipt of course packages. Through the Virtual Campus

Initiative (VSI), IGNOU is enhancing administration of its courses through online registration and payment options. Several subjects feature online assignment generation, assignment submission, online multiple-choice-question examinations, and automatic grading and record keeping, all conducted via study centres. Online orientation programmes assist students to learn in the new medium, and other computer-based tutorials are available in the study centres, often a rented space from major private ICT providers in major cities. However, IGNOU has ambitious plans to equip its own centres.

Also encouraging is a University of Waikato project, the New Zealand Digital Library. The site lists all the software programmes needed for access, such as RealPlayer, QuickTime and MPEG, with instructions on how to download these. Details of the project, which aims to develop integrated platform technologies for educational purposes, are at www.nzdl.org/cgi-bin/library. Currently it lists Waikato's library catalogue in history, humanitarian and global development, computer science, music and literature, but its intent is to make the technologies publicly available so other institutions can develop their own digital collections.

SCHOOL SECTOR DEVELOPMENTS IN DISTANCE LEARNER SUPPORT

As outlined above, because primary and secondary education is the basic vehicle for community and social learning, school sector distance education is a minuscule proportion of state education activity, even where, as in Australia, with its remote small populations, there are well-established, excellent distance programmes.

State governments in Australia have instituted pilot programmes online to increase the subject range for smaller secondary schools in rural areas. They have also supplemented more traditional distance methods such as radio (in Queensland's School of the Air) with Internet communication, but the cost of long-distance telephony in Australia remains prohibitive for many families, and technical problems caused by sunspots disrupt service frequently. More traditional modalities are employed in large distance school systems such as the Malawi College of Distance Education, which enrols two-thirds of that country's secondary school students.

Elsewhere, numerous government reports on the potential of the Internet at school level suggest its usefulness be supplemental. For example, in the U.S., a comprehensive review, "The Power of the Internet for Learning: Moving from Promise to Practice" is available at www.webcommission.org. The Canadian Telelearning Network Report (1998) concludes its review of education literature on the use of ICTs by saying "...the most innovative and promising practices centre around authentic problem-solving, inquiry-based learning, and collaborative knowledge building. Most findings are concerned with context and process rather than content or outcomes." The same report elaborates on the far more extensive literature on post-secondary uses of the Internet, most in on-campus institutions (Lewis, Smith and Massey, 1999).

There are some examples of well-established online programmes in the secondary sector, for example Florida High School (www.fhs.net), although nearly 80% of the school's online students are also on-campus in public schools, and the courses have a 25% attrition rate (Trotter, 2001).

A plethora of materials are available for "mining" by enterprising distance educators in the school sector. Many state and regional education authorities have sponsored resource collections online, vetted to ensure their suitability for particular grade levels (see, for example, www.education.vic.gov.au). Professional associations have vast databases of educational materials, and many individuals within educational institutions have combined their subject passion with the distributive power of the Internet. Commercial sites are also useful, some blending free and fee-based services (e.g., learnersonline.com). Exploiting the full potential of such materials has thus far proved difficult for distance educators at the school level.

ONLINE SUPPORT FOR LIFELONG LEARNING

It is widely accepted that the greatest potential for online education is in the realm of lifelong or continuing education, most particularly work place-based education. Certainly that is the sector targeted by commercial providers and the training units of corporations, where the drive is as much budgetary as it is the competitive drive for speed of distribution. Predictions of savings in the order of 15% to 50% are expected because travel and per diem costs can be slashed. Yet many companies are reporting strong resistance to losing face-to-face training, for the same reason that online education has been resisted within school leaver populations at university: that the *social* process of company training is as important as the technical or performative knowledge gained (Cunningham et al., 2000).

Nevertheless, a company intranet for education and training has become a standard feature of large professional consultancies, such as Arthur Andersen Performance and Learning, and PricewaterhouseCoopers. Policies and procedures are quickly shared across the globe; a query posted to a bulletin board elicits answers or suggestions or examples from a dozen different offices. This, of course, is informal learning in the main and may be termed "distributed expertise." It reveals the power of the medium to stimulate collaborative social learning within a group: in this case a group ethic has already been developed, albeit one based on company and individual performance. But the learning process could well be applied in an educational situation if a community of learners has been formed. It is significant also because it has spawned a fruitful area for further exploitation of the technical power of networks through knowledge management systems in the OECD sense of the term, as described above.

In more formal training programmes, such as certifications in the ICT industries, online learner support appears of little concern, since the training is so focused. Although Microsoft's early venture into online training, Microsoft Online, was not a success, the company is now licensing a number of training providers to develop online educational programmes which incorporate Microsoft's own training materials, including e-mail tutor support (generally at additional cost), for certification programmes in proprietary software products, such as the Microsoft Certified Practising Engineer. Because the training is confined to the use of a product, there is little learner support offered; motivation is presumed to be intrinsic, the learning is narrow and instrumentalist and there is no reference needed to resources beyond the package.

Large corporations have both the resources (human and budgetary) and the infrastructure (in technology and systems organisation) to support their staff's training needs. They often encourage distance education as a mode of continuing professional education because it improves staff work performance, and it is generally conducted in the staff member's own time, rather than in company time.

The situation with smaller companies is generally less conducive to education and training. Lifelong learning, frequently conceived as work-related skills training (Ryan, 2000), is considered critical to the survival of small and medium enterprises (SMEs). "Distributed" learning, a form of distance education, and more particularly online learning, is the favoured medium for such learning

Hence the U.K's. University for Industry (UfI) (www.ufiltd.co.uk) was established with a double mission to re-skill British workers for the knowledge age and to use ICTs to achieve this goal. Through learndirect, a network of over 700 learning centres equipped with computers, over 80% of its courses are offered online (see www.learndirect.co.uk); it promises that "help is at hand at your learndirect centre, or you can call the freephone learner service helpline."

Ufl contracted Marchmont Observatory, at the University of Exeter, to both facilitate and review the success of the operation. The result has been a series of workshops for practitioners and managers and SME employers and employees, as well as a listserv and an electronic newsletter-sharing experience on the programme. On each of the themes that Marchmont has identified as critical to lifelong learning, the unit prepares a final research brief, a simple four-page summary and analysis of the main topics raised in each forum, and a brief reading list. It restates the guiding mission of the Ufl planners that "effective learner support is crucial to the success of the Ufl learning model" (Marchmont Observatory, 2000). This is supported by a joint survey of e-learners, providers and employers which reveals that 96% of learners wanted support (Campaign for Learning, 2001).

In the longer research report on learner support, Evans (2000) concludes that the technology itself is daunting to non-traditional learners with little experience in using computers. Free ICT lessons may be a necessary precursor to online education, along with learndirect centres, where employers and workers can access mentors, tutors and equipment, complemented with call centres staffed with expert advisers fully conversant with the range of available work-related and academic programmes. Evans commends a full programme of professional development for online tutors in a lifelong learning environment, and points particularly to the South Yorkshire College Consortium's Learning to Teach OnLine (LeTTOL) programme, which features pre-course assessment of online competence (Evans, 2000). The challenges of implementing this ambitious programme of online learning among a population that may not be disposed to either formalised learning or learning via technology should not be underestimated, Evans adds. While the Ufl concentrated on developing programmes of content, it overlooked the critical importance of supporting students *through* a programme and of acknowledging a maximum "shelf life" of 18 months for its industry programmes. Nor did its managers acknowledge the difference between supporting students who had close access to a learning centre, and those remote from such centres.

Other informal learning programmes for adults have proliferated, many in basic education, and these have potential for adaptation in developing countries. For example, in Australia, Victoria University's Technical and Further Education Division has established a Maths Connexions for Adults course at www.vu.edu.au/mcaonline.

However, these suggestions point to a segue from virtual education to a hybrid model for adult learners, with some face-to-face classes, especially at orientation stage. Bleed (2001) has argued persuasively for a similar model to handle increased enrolments in all education sectors. This hybrid model seems to be the preferred option at government level in the U.S. at least: the Internal Revenue Service has contracted the Arthur D. Little School of Management and 16 public universities to provide a blended virtual/physical programme of continuing professional education for its 100,000 employees. While 95% of current professional development is class-based, there will be a gradual shift to a mixture of distance and physical classes.

Driving and Constraining Forces to Online Learning Support

No innovative educational practice is free from forces which both drive and constrain the degree to which it is adopted and becomes mainstream.

Lewin's work (1976) on force fields demonstrates that the strength of drivers for innovation may overcome opposing factors, leading to adoption of the practice; equally, opposing forces, which may include resistance among staff or external factors such as costs, may prevail and prevent widespread adoption. If the driver's are visionary, and the constraints are financial and technical, we can generally assume that mainstreaming will be long delayed.

In the case of virtual education, the drivers are clearly visionary. Other chapters in this volume outline the critical need for education in developing countries, which can only be addressed through distance modes. Policy-makers see the potential of the Internet to relieve the escalating costs of physical infrastructure in education, particularly in developing economies with high populations, and the importance of "leap-frogging" the elitist stage of physical educational systems. Politicians see a dream to hold out to their constituencies. Education managers see savings in staff costs, typically the largest component of an education system, if students become more independent learners and learning materials can be developed for re-use in multiple contexts and can be delivered virtually. They also cling to visions of larger, fee-paying markets.

Some educators see the real attraction of speed of communication with distance learners and the potential for social learning among peers, previously unavailable via conventional distance methods. Indicative attrition rates given in this chapter also highlight the need for an increase in learner support services, which can be provided more efficiently online. Others see the technology as a boon to continuing and lifelong learning.

Among practising distance educators, the drivers for online learner support services are strong forces: the immediacy of communication is of obvious benefit in motivating students, allowing for the feedback which is a constant concern to distance learners. A skilful facilitator can create a community of learners which can replicate the social learning atmosphere needed by most learners. The social factor that prevents students from considering distance education can be addressed, and constant frequent motivation supplied by both teacher and fellow students in a class situation can reduce the lack of support that leads to withdrawal. A world of resources outside the home institution can be accessed. Student record-keeping and administration can be made convenient and transparent for both teachers and students.

However, the constraining forces appear to dominate at present, and cost, rather than technical difficulties, is the greatest of these (Bakia, 2000). Even where the infrastructure has been installed, the costs of quality learner support are substantial. Managers have often severely underestimated the maintenance costs of intranet and Internet systems, both in relation to the current instability of many applications and the integration of different platforms, and to the human resources needed to support students and teaching staff in a new technical and pedagogical environment. The authoritative literature now concedes that far from being a cheaper alternative in educational applications, virtual education has high development costs. The "help desk crisis," frequently reported in Steven Gilbert's AAHESGIT listserv (see the listserv/AAHESGIT section of www.tltgroup.org) is only another aspect of this. Teachers are also reporting greater demands from students, deluges of e-mail and more frequent recourse to technical assistants. However, Hilsberg (2001) estimates that support service costs can be reduced to 20% to 40% of total costs if cheap labour is employed through geographic shifting of personnel, with marketing and sales consuming another 10% to 40%.

Other factors are the skill level of both teaching staff and potential students and their disposition to learn via technology. Extensive professional development is necessary before teachers can utilise Internet-based communication modes to benefit their students and themselves, and as the guidelines canvassed above indicate, there are numerous considerations that most teachers have rarely considered.

In countries without an extensive and stable telecommunications system, a low GDP and little personal disposable income for computers and connection charges, the cost constraints are staggering. One area amenable to cost reduction is sharing of distance library resources through joint buying power and licensing arrangements for databases. The Commonwealth of Learning has already broached this idea through its Knowledge Management Roundtable (www.col.org/knowledge) and subsequent proposal of COLINKS, the Commonwealth Open Learning Interactive Network (www.col.org/KMR) to build on the existing Information Resource Centre. Until the constraint of copyright laws restricting re-digitisation of materials is alleviated for developing countries, electronic access will continue to be prohibitive for many students.

Issues for Policy-Makers and Managers

Many of the issues faced by policy-makers and managers, especially those in developing countries, can be inferred from the above discussion. To reiterate those that have been canvassed:

- Virtual education is no "silver bullet" that can solve all educational problems, notwithstanding its undoubted promise. This is partly because of the immense costs involved, even if wireless applications and satellite links can replace landlinks in remote and rural areas, and where physical infrastructure is commercially unfeasible. It is also because of entrenched beliefs about education as a social and socialising experience which can never be satisfactorily replicated in a virtual environment.
- Although distance education is generally perceived as less costly than classroom-based education, and organisations like the UKOU have demonstrated that with volume they can educate an adult for substantially less than an on-campus student costs and at significantly less cost to the student as a result of savings in travel and living expenses and the opportunity costs of full-time study, these savings are based on print and post-delivery modalities. Development costs of online materials and the systems to support them are considerable; ongoing institutional costs increase with the necessity of help desks for technical and academic learner support. Learner costs increase as download volumes increase, and the student bears the costs of printing.
- The "digital divide" in current computer ownership and connection rates, even in developed economies, means that Internet-based education denies one of the underlying principles of distance education: to cater for those disadvantaged by income and circumstance. We cannot exclude students because they lack the means and the skills to benefit from education at any level. (One listserv which considers these questions is at www.digitaldividenetwork.org.) Equally, we cannot exclude those whose circumstances include computer ownership and connectivity, but who lack the time or ability to learn on campus. Balancing the opportunities provided by ICTs while striving to overcome the divide is crucial.

A further issue relates to the retention of cultural and national identity in a borderless education market. While there has been an encouraging increase in the number of general and education Web sites emanating from non-Western sources, the high costs of creating original resources continues to reinforce the dominance of

U.S. Web browsers and sites (Wilson, Quyyam and Boshier, 1998). This is not to denigrate the quality and usefulness of materials on the simplistic grounds of source or ideological opposition. However, most national governments are concerned about providing for their citizenry materials which reflect their cultural, social and economic contexts, and which contribute to national interests: see, for example, the Preface to the Canadian study (Lewis, Smith and Massey, 1999) on online education referred to above, and Evans and Rowan (1997). Automated translation programmes might appear to provide a technical solution to support services in a home language, but language, as Bates makes clear in this volume (see Chapter 3), is not the only cultural consideration in learning. This suggests that one crucial decision revolves around training of local staff in developing countries, and the twinning arrangements discussed by Bates provide a workable and equitable model, albeit not inexpensive.

Policy-makers must also confront the inevitable plethora of programmes, courses and opportunities offered to their citizens in an emerging globalised learning environment, including the implications of such movements for credit banking and transfer of prior learning. Under the combined pressures of vocationally oriented education and training, Web-based short courses, the promises of individually customised and modularised topics of study and the interests of educational institutions and commercial vendors in the continuing professional education and lifelong learning market, it would appear inevitable that evaluation and assessment of learning activities will become a significant component of the education sector.

Many U.S. companies such as Sylvan/Caliber have already established a niche in evaluation of certification programmes, such as those in the ICT industry (Adelman, 2000). Certification in the ICT industry has therefore become a globally recognised form of accreditation. No similar global accreditation programme applies in formal education, and no agency exists with the authority to validate educational attainment at the individual subject/course level, although the Association of Commonwealth Universities acts to verify at the institutional level. It is left to individual departmental authorities to gauge subject credit transfers towards a formal degree programme. At the school level, no agency verifies distance programmes.

There would appear to be an urgent need to establish a low-cost, independent agency which could validate distance-delivered subjects and courses for all institutions and sectors, similar to the University of Phoenix's database, and which could also act as an authoritative database of accredited distance providers and courses. The Commonwealth of Learning and the World Bank's Global Learning Network might provide a credible base for such an agency.

Conclusion

While the promise of ICTs in learner support is improved access to the rich resources of on-campus education, as well as access to education itself for those disadvantaged by distance or circumstance, the digital divide (measured as economic, social and dispositional factors) may actually exclude many students if ICTs are the sole form of learner support.

And while the potential of ICTs to enhance the quality of learning and the learning process itself is exciting, as has been demonstrated in many projects, there has been no systematic research into the efficacy of online support services in improving retention, progression, attainment and satisfaction rates. Common sense would suggest a positive correlation between improvement in these rates and extension of learner support services, but the very newness of these services, and their patchy implementation, has prevented the definitive research needed.

"The jury is out" on cost efficiencies via learner support until Taylor's Fifth Generation systems and intelligent tutoring systems are technically and economically feasible. Thus far, cost savings in quality programmes have proved ephemeral. Learner support in both on- and off-campus situations is labour intensive, as with any quality customer service. Yet the costs of not providing such services are even greater in terms of student frustration and failure, wastage of institutional resources and the immeasurable loss to any society of a citizenry lacking the education it desires.

These issues suggest that most educational systems will need to maintain dual systems for some time to come: maintaining print-based systems and building, cautiously, the capacity of their institutions to utilise virtual forms of student support. They must also provide professional development for their teaching and administrative staff and begin to build student learning skills and the disposition to learn in digital, more independent learning environments. They should focus their resources on those best placed to benefit in a context of limited resources: professionals and teachers, since retaining and re-skilling such individuals is likely to be critical to a country's present and future development.

The challenges are immense, and managers and policy-makers themselves must be engaged in a constant learning process to understand and evaluate the many choices offered by online technologies to enhance distance learning.

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6

The Development of New Organisational Arrangements in Virtual Learning

DR. PETER J. DIRR

Introduction

An overriding theme of much of today's literature on distance education is the extent to which alliances among colleges, between colleges and high schools, and between colleges and commercial interests are playing leading roles in the development and delivery of distance and open education, especially when that education is delivered through information and communication technologies (ICTs). (The term "virtual education" is used in this chapter as inclusive of such educational programmes, which others might refer to as distance education, open education, distributed education, flexible learning or other similar term.) These trends are clear in North America and are beginning to be seen elsewhere. While this chapter cites several examples of developments in virtual education in North America, those examples are intended to help policy and education leaders in developing countries envision how new organisational arrangements using ICT might benefit the people of their countries.

In part, the trend towards partnerships and alliances in virtual education reflects a larger trend in society, especially in the business sector. Corporate partnerships and alliances dominated business news headlines at the end of the 20th century. The partnerships were often driven by the need to expand business by building new sources of customers, something referred to as increasing "market size." In order to support existing infrastructures and ever-increasing costs of doing business, corporations were driven to increase their revenues by increasing the size of their customer base. It was no different for institutions of higher education. In the U.S., for example, while enrolments in higher education were growing steadily, and tuition income along with them, the increased enrolments by themselves could not provide sufficient fuel for expansion, leading some institutions to look for new markets. In some cases, they looked abroad. This became apparent in news accounts of the expansion.

In "Hong Kong's Boom in Distance Education May Be a Sign of What's to Come in Asia," Cohen (2000) reports on the attraction of Asia as a new market for U.S. higher education because of its size alone. It is estimated that 500 million people in Asia need higher education. In many places, large percentages of the population live in isolated areas and cannot afford to leave those areas to pursue higher education. In Hong Kong, the world's second most densely populated urban centre, the issue is not distance but rather space to accommodate additional learners. Cohen notes that more than 100,000 students have studied at the Open University of Hong Kong (www.ouhk.edu.hk) during its first 11 years of operation, about 10% of them earning degrees

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so far. Those numbers are very attractive to U.S. institutions looking to export their distance learning programmes to new student populations.

Another huge market is India. According to Overland (2000), Carnegie Mellon has set up a new distance education programme in conjunction with the Indian Internet service provider, Sterling Infotech Ltd. The programme will lead to a certificate in computer programming. Carnegie Mellon, with a total U.S. enrolment of fewer than 8000 students, hopes to enrol 15,000 students in India in online courses in 2001, growing to 100,000 in a couple of years. According to Sanjiv Kataria, senior vice president of NIIT, one of the largest computer-education companies in India, "There are one billion Indians to be trained in computers."

SEVERAL FACTORS in the U.S. have converged to provide an environment that is conducive to the development of virtual education programmes. Those factors include:

- A culture that places a high value on learning.
- "Market size" that all but guarantees enough learners for multiple programmes.
- Strong existing systems of public and private education at all levels.
- Strong technological infrastructure that reaches throughout the country.
- An affluent population that can afford to pay for education.
- A tradition of employer-supported workforce education.
- A culture of philanthropy and multiple foundations with billions in assets.

Not all of those factors exist in other parts of the world. The absence of one or more of the factors will affect how well U.S. models will work in other cultures and settings.

The size of the potential market for distance education, both in the U.S. and abroad, is attracting large investments by businesses and venture capitalists. Writing in *Syllabus*, Von Holzen (2000) estimated that more than $4 billion would be invested in for-profit educational companies in 2000, growing to $15 billion by 2002. He predicts that much of that funding will find its way to distance education programmes.

Many of the new distance education programmes are Internet-based. Businesses see the Internet as facilitating education opportunities for people who have not had access to such opportunities in the past. They have been willing to invest in that potential, at least until the stock market pull-back in the middle of 2000. Investment in online education companies is just a small part of the enormous investment made in Internet-based companies in general in the late 1990s. According to an annual study by Andrew Whinston of more than 3000 businesses that receive at least part of their income from the Internet, the Internet economy grew by 62% from 1998 to 1999, producing $524 billion in revenue (Mangan, 2000). And, according to International Data Corporation (Evans, 2000), which follows more than 200 electronic-learning companies, the e-learning market will grow from $550 million in 1998 to $11.4 billion in 2003. (It should be noted that none of these predictions can be made with exact precision. In the very least, they are subject to revision periodically, especially in view of the economic downturn that began just as the authors of this volume were conducting their studies and writing their articles.)

Much of the new investment in virtual education involves the development of new institutions as well as the creation of new partnerships and alliances among existing institutions and companies. The types of new institutions and alliances are plentiful. Some have been well-documented in stories in *The Chronicle of Higher Education*. Others are less well-known.

New Virtual Education Institutions

Most countries have opened at least one open and distance university since the U.K.'s Open University (UKOU) rolled out its successful model in 1970 (www.open.ac.uk). By 1997 John Daniel, Vice Chancellor of the Open University, in *Mega-Universities and Knowledge Media*, identified

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11 mega-universities in the world that provide distance education, as follows (with 1997 enrolment figures):

- Anadolu University, Turkey, 578,000
- China TV University, China, 530,000
- Universitas Terbuka, Indonesia, 353,000
- Indira Gandhi National Open University, India, 242,000
- Sukhothai Thammathirat Open University, Thailand, 217,000
- Korean National Open University, Korea, 211,000
- National Centre for Distance Learning, France, 185,000
- The Open University, Britain, 157,000
- University of South Africa, South Africa, 130,000
- Payame Noor University, Iran, 117,000
- National Centre for Distance Learning, Spain, 110,000

While Turkey's place as the largest enrolment of all distance education institutions in the world is undisputed (MacWilliams, 2000), new institutions continue to be opened in both developed and developing countries.

NEW VIRTUAL UNIVERSITIES

Perhaps the most ambitious venture in recent years that uses information and communication technologies (ICTs) to deliver distance education has been the African Virtual University (AVU) (www.avu.org). Recognising the close tie between education and economic growth and prosperity, and with higher education in sub-Saharan Africa in a crisis, in mid-1997 the World Bank provided initial support to develop a prototype phase of the AVU, a "lifeline from cyberspace" for the sub-Saharan African countries. AVU would use satellite television, the Internet and printed materials to help overcome the many financial and physical barriers that prevent students in the participating African countries from gaining access to quality higher education. AVU was seen as particularly relevant in the emerging economies of African countries whose workforces lacked vital technical skills. Initial courses would focus on science, engineering and business. The plan was for AVU to evolve over a three- or four-year period and to be self-financing at the end of that period.

Others joined the World Bank to provide start-up funds for AVU. The World Bank contributed several million U.S. dollars. The Africa Region Development Fund provided $1.165 million; the Canadian Trust Fund donated Cdn.$1.5 million; the Irish Trust Fund contributed £200,000; the European Commission pledged ECU 1 million; and Portugal pledged funds to develop Portuguese language programmes (World Bank, 1998/1999). Since July 2000, Kenyatta University in Kenya has been the host institution for the AVU headquarters.

A pilot phase was launched in April 1998. Twelve universities in six English-speaking countries (Ethiopia, Ghana, Kenya, Tanzania, Uganda and Zimbabwe) were connected through AVU to universities in the United States and Europe. Just a few months later, the pilot had grown to include 25 African universities, including some in the francophone countries of Benin, Burkina Faso, Côte d'Ivoire, Mauritania, Niger, Rwanda, Senegal and Togo. Supporting universities had grown to include the University of Massachusetts and the New Jersey Institute of Technology in the United States and the University College Galway in Ireland. During this pilot phase, there were no exclusive virtual university students; selected students enrolled in existing courses at participating universities, received instruction and took exams via the technology. A second phase, begun in January 1999, offered complete curricula for full-fledged undergraduate degree programmes.

By mid-2000, AVU had expanded to include 25 learning centres spread across eight anglophone and seven francophone countries (Okoko, 2000). More than 5000 students had completed semester-long courses in the sciences and over 2000 had taken part in seminars on topics such as e-commerce (Europe Information Service, 2000). Over 30 academic institutions, including those from Africa, Europe, Ireland, Canada and the United States, provided course material.

Some are sceptical about the impact the African Virtual University might have on the educational needs of Africa. Akim Okuni (2000), a lecturer at the Islamic University of Uganda, notes that there are difficulties inherent in education through the Internet in Africa. While enrolments in secondary schools have increased in recent years, increased poverty has reduced many individuals' ability to pursue higher education. That raises the question of whether AVU will be less likely to benefit a significant proportion of the African population because of their inability to pay. Furthermore, AVU's success will greatly depend on the telecommunications infrastructures of the participating African countries. In those countries, the telecommunications systems suffer from "unstable and insufficient power supplies, unreliable and congested telephone links, and unaffordable cost." In short, telecommunications systems in the participating countries are far too expensive for the intended students of AVU, according to Okuni. He suggests that the ambitions of AVU "might perhaps seem rather too optimistic at this moment in time…Africa is currently not up to the challenge."

QUITE SEPARATE from involvement in the African Virtual University, Ghana has committed to using distance education to meet the education needs of identified sectors of the Ghanaian population. With financial assistance from the Canadian International Development Agency (CIDA) and support from Simon Fraser University, four Ghanaian tertiary institutions have initiated the Ghana Distance Education Development Project (Centre for Distance Education, n.d.). Over a five-year period (1995 to 2000), the University of Ghana, University of Cape Coast, University of Science and Technology and University College of Education of Winneba developed a distance education system to address the educational, social and economic needs of the country. The mission of the consortium is to make education more relevant to Ghanaian needs, provide greater access to education and prepare the workforce towards the attainment of middle-income status by the year 2020.

Okuni's scepticism is shared somewhat by Darkwa and Mazibuko (2000). They cite several potential barriers to success:

- The technological challenges ("even though Africa has about 12% of the world's population, it includes only 2% of the global telephone network with over half of the lines in cities").
- The lack of trained professionals to support the implementation of distance education.
- The absence of clearly defined national distance education policies.
- The lack of connectivity.
- The high cost of tuition and Internet services.
- The general poverty of the region.

However, they also note that the University of South Africa enrolled over 130,000 persons in its distance education programme in 1995, over one-third of all university enrolments in South Africa in that year. Although sceptical, Darwa and Mazibuko see partnerships with businesses and industries, the government and foreign partners as potential ways to overcome the deficits that are challenging distance education in the region.

While AVU might be confronting challenges that are unique, it is not the only new, large-scale open and distance institution created in recent years. The University of the Philippines Open University (UPOU) was established in 1995 to provide quality education to a growing population distributed over 7000 islands (www.upou.org). It was seen as playing a critical strategic role in the country's economic, sociocultural and political development and progress (International Centre for Distance Learning, 2000). UPOU is mandated to:

- Increase access to education.
- Sustain professional growth.
- Promote lifelong learning throughout the country.

Collaborative arrangements and institutional agreements are built into UPOU's mandate. It uses print, audio, video and online resources to deliver course materials to distance learners and backs them up with once-a-month tutorials in learning centres. As of the 1999–2000 school year, UPOU had 1068 graduates and a current enrolment of 1209 students, which it expected to almost double the following year.

Although not as new as AVU and the UPOU, the Taipei National Open University, established in 1986, has received new recognition in Chinese Taipei (www.nou.edu.tw). Distance education has been identified by the government as a key tool and a fundamental instrument for redeveloping vocational and technical skills throughout the country to keep the workforce competitive and to sustain economic development (Huang, 1997). Through 1996, the National Open University (NOU) had graduated 12,000 adult students and countless others had learned informally from the educational programmes broadcast by the university. The university's demographics are illustrative of how an open and distance learning institution can provide access to underserved populations: 70% of the NOU students are female; 65% are 25 to 39 years old. Typically, NOU students are married, middle class and have incomes slightly below the average. NOU represents an opportunity for them to improve their standard of living.

Besides these three examples of large institutions that serve large populations of potential students, there have also been smaller, more targeted and specialised distance education institutions established. In 1999, two small U.S. institutions, Berean University and ICI University merged to form the Global University of the Assemblies of God (www.globaluniversity.edu), a distance education institution that provides ministerial training, undergraduate and graduate education, and curriculum materials to the Christian community worldwide (General Council of the Assemblies of God, 1999). Delivery systems include print, Internet, CD-ROM and videoconferencing. The combined institutions have an enrolment of about 10,000 students pursuing undergraduate and graduate degrees and ministerial certification.

Not all new activities in virtual education involved new institutions. In 1996, the Open University in the U.K. established Open University Worldwide (OUWO) to export its courses and services globally (www.open.ac.uk/collaborate/contact.htm). By the end of 1999, OUWO had overseas enrolments of more than 20,000, and that number was growing (Carty, 1999).

About the same time, the Monterrey Institute of Technology (ITESM) was expanding its distance education programmes beyond the borders of Mexico and into many of the Spanish-speaking countries of Latin America (www.sistema.itesm.mx). Their system of one-way satellite and Internet-based communications has 1302 receiving sites in Mexico and 127 in other countries in Latin America. Among their 15 distance education degree programmes (in business, engineering, technology and education) is an M.B.A. programme developed and offered with the Arizona-based Thunderbird School of International Management and a certificate programme in educational technology developed and offered collaboratively with the University of British Columbia (Carty, 1999).

In India, the Indira Ghandi National Open University (IGNOU) has for years used multimedia kits and broadcast radio programmes to deliver courses to students at a distance. In July 2000, IGNOU began also to use online delivery. The Virtual Campus Initiative started with courses in information technology management (Sharma, 2001). Established in 1985, IGNOU offers an extensive array of print and multimedia-based courses and serves as a resource centre for nine other state open universities. IGNOU operates 700 study centres throughout the country and is one of the chief resources in India for those who wish to improve their qualifications and sharpen their academic skills.

The Virtual Campus Initiative is only the most recent innovation in distance education that IGNOU has introduced to India. In 1998, IGNOU sought to remove "three types of tyrannies" that often confront distance education programmes: the tyrannies of space, time and a fixed curriculum. IGNOU's goal was to transform itself into a global virtual university serving "anyone, anytime, anywhere." The Virtual Campus Initiative is still in the early stages of development. Currently, only 10% of all IGNOU students are involved with online education compared to other formats, but clearly, the leaders of IGNOU see the Virtual Campus Initiative as a promising direction for the future.

Developed as well as developing countries continued to create new distance universities. The following are just a few examples:

- France's prime minister unveiled plans to create an Internet university in Marseilles that would offer graduate engineering degrees. (One study reported that France will be short 60,000 engineers by the year 2005 given the current productivity of its tertiary institutions.) The new university will build on the resources of existing universities. This was seen as a key component in France's efforts to remain competitive with the United States and Canada in Internet research and education (Giudice, 2000).
- A partnership agreement between Capilano College and Athabasca University (both in Canada) created a programme to provide degree completion opportunities. Capilano College graduates will be admitted to Athabasca's bachelor's degree programme with advanced standing and will study entirely at a distance through home study (Longworth, 1999).
- In the United States, the Arizona (state) Board of Regents plans to create the Arizona Regents University by combining distance education courses from the University of Arizona, Arizona State University, and Northern Arizona University. The plan is backed by elected officials (Carnevale, Sept. 12, 2000).
- The state of South Dakota in the U.S. created the Electronic University Consortium of South Dakota based on distance education and training courses available from six public universities (Electronic University Consortium, 2000). The Consortium offers courses for working adults, employees seeking career development skills, persons with disabilities and others.
- The U.S. Native American community is working to form a Distance Education Institute that will provide culturally sensitive curricula (high school and college) for the dispersed Native American population using electronic technologies (Craig, 1999).
- In the 1980s, the Board of Regents of the University of the State of New York established Regents College to develop exams to accredit learning that adult students acquired on their own. The college would have no full-time faculty and would offer no formal programme of instruction. Rather, it would refer interested adult students to learning resources that they might use for independent study. Regents College, renamed Excelsior

College in 2000 (www.excelsior.edu), grades the exams and "banks" the credit as the student progresses towards a degree. Excelsior also uses a CAEL-like approach to assess and accredit other non-formal student learning. In fact, the motto on which Excelsior was founded is, "What you know is more important than where or how you learned it." Excelsior recognises that there are many valid sources of learning that can mean credit towards a degree, and it offers its students study resources, including an online library provided by Johns Hopkins University.

- A partnership between the Ford Motor Company and Deakin University (Australia) allows Ford employees to complete a Vehicle Industry Certificate course and a supervisory course by distance education as well as a bachelor's degree in Technology Management and Manufacturing (Forster and Mitchell, 1995).
- National Extension College and the University of Bradford Management Centre offer the FrontLine degree programme for junior merchandisers at Coca-Cola Enterprises, Cadbury, and Schweppes Beverages Limited. Research showed that the programme challenged some of the "vernacular theories" of traditional academics about how teaching and learning best occur. "The distance education methods, with an emphasis on learning and student centredness, bring into question the power of the academic to control the process" (Lentell, 2000).

Perhaps one of the most promising new organisational arrangements with potential to serve students in developing countries is still somewhat tenuous. In March 2000, Michael J. Saylor, the billionaire founder and chief executive officer of MicroStrategy, a U.S. company that sells e-commerce software and services, announced that he planned to use $100 million of his fortune to create an online university that would charge no tuition (Carr, Mar. 17, 2000). "It's one thing to give a scholarship to three or four or five or 50 people," Saylor said. "It's another thing to make tuition free for everyone forever."

The new university would broadcast courses taught by "famous people" all over the world through streaming video. The courses would be produced in a "cyber studio" in Washington, where academics, artists and politicians could record lectures that would be broadcast on the Internet. "My idea is to create all this content and make it available to 100 million people who have no chance of going to Harvard," said Saylor. At the time of the announcement, Saylor had not pinned down many of the specifics, including the content of courses or the feasibility of such a service for learners in developing countries.

Not more than three months after his announcement, Saylor's company experienced financial difficulties that resulted in the value of its stock falling almost 95% (Carr, June 22, 2000). Saylor, a major shareholder, personally lost about $11 billion. Nevertheless, he did not abandon the idea of founding the university. In February 2001, he announced that he would sell 15,000 shares of MicroStrategy stock every day for two years to keep his promise to create the university. Saylor believes that the project might be a 10-year plan, but he is committed to seeing it through to completion.

NEW FOR-PROFIT UNIVERSITY INITIATIVES

The presence of for-profit universities is not new, at least on the landscape of American higher education. However, the rapid expansion of the distance education offerings of some for-profit institutions has been dramatic over the past couple of years, and it is likely to remain that way for the foreseeable future assuming that the institutions are able to tap into new lucrative markets for continuing education of adults.

In the late 1980s, cable television operator Glenn Jones created a for-profit subsidiary to offer college-level telecourses over cable. Mind Extension University not only broadcast the courses but also distributed textbooks, referred students to colleges that offered the courses for credit, and generally facilitated student learning. By the late 1990s, Jones had expanded his ambitions in education. He embraced Internet technologies as well as cable and created a freestanding virtual university, Jones International University (www.jonesinternational.edu). It became the first electronic university in the United States to receive accreditation, being so recognised in March 1999 by the North Central Association of Colleges and Schools.

Jones International offers a bachelor's and master's degree in Business Communication, a master's of Education in e-learning, and a master's in Business Administration (in English and Spanish), with specialisations in e-commerce, information technology management, global enterprise management, entrepreneurship, conflict management and health care management. It also offers professional certificate programmes in Public Relations and Marketing, Global Communication, and Leadership. All Jones courses are a blend of theory and practice. Besides its standard courses, Jones has a Corporate Partnership Program, through which it will customise courses for workers of companies that contract with Jones.

In addition to providing courses, Jones offers its students with a variety of support services online, including an electronic library (through a subsidiary company, e-Global Library, www.e-globabllibrary.com), a bookstore, academic advising, technology support and student profiles. All of the courses and support services are available to students anywhere in the world.

In August 2000, the largest for-profit university in the United States, the University of Phoenix (www.phoenix.edu), announced a new plan for foreign expansion (Blumenstyk, Aug. 11, 2000). Already serving 75,000 students in the U.S., the Apollo Group (the company that owns the University of Phoenix) announced its intention to develop, acquire or create partnerships with institutions in Brazil, China, India, Mexico and several other countries in Latin America and Europe. Within 10 years, the plan is to have the overseas operation the same size as the U.S. institution. Investors in the new company, Apollo International, include Kaplan Ventures, Chase Capital Partners and some of Apollo's executives. The company had raised $40 million for the venture and is expected to raise a similar amount in secondary funding. It is likely that this type of vision could only be possible for a for-profit institution since most public institutions would not have the flexibility to raise funds for such an expansion.

The Apollo Group is driven by their view of the size of potential markets — 2.1 million college students in Brazil today will grow to 5.1 million by 2008; in Mexico the number of college students is expected to grow from 1.8 million today to 4 million by the end of the decade; in China, 21 out of 22 high school students have no place to go for higher education.

That market potential is also leading one of the University of Phoenix's competitors, Sylvan Learning, to expand its overseas operations. Other competitors such as DeVry Inc., Harcourt Higher Education and the 30 colleges formerly owned by Quest Education, recently acquired by Kaplan, Inc., are expected to pursue overseas markets soon.

By October 2000, the University of Phoenix had raised an additional $70 million on Wall Street by selling a tracking stock. In issuing the stock, the university noted that its online programme is growing twice as fast as the on-the-ground programme. Students in the online programme come from 25 countries, according to John Sperling, Chairman of the Apollo Group (Blumenstyk, Oct. 13, 2000).

A major U.S. publisher entered the higher education distance education market at the close of the 20th century (Blumenstyk, Sept. 8, 2000). Harcourt received approval from the Massachusetts Board of Higher Education to operate its Virtual College in the state and announced that it would seek accreditation from the regional accreditation agency, New England Association of Schools and Colleges. It planned to offer degree programmes in business, health science and information technology and hoped to enrol 50,000 to 100,000 students within five years, a growth rate unheard of in traditional higher education in the U.S. It was not clear what proportion of its students Harcourt Virtual expected to come from overseas. It planned to charge about $900 per course, making it competitive with many traditional institutions.

Harcourt's plans were thrown into question only two months later when it sold its interest in Harcourt Virtual College, along with other assets, to Toronto-based Thomson Publishing for $2.06 billion (Blumenstyk, Nov. 10, 2000). Thomson would not say if it would continue Harcourt Virtual College, although Robert S. Christie, president and chief executive officer of Thomson Learning shed doubts on the college's future when he said, "… degree-granting responsibilities belong to the experts in that area."

NEW VIRTUAL HIGH SCHOOLS

The use of ICT is not new at the secondary school level. As early as 1968, Mexico introduced Telesecundaria (www.sep.gob.mx/csoc/comunica/19991222_000759.htm) as a tool to help classroom teachers improve the quality of education throughout the country. Telesecundaria's model has been to produce and broadcast 20-minute lessons (on public television channels). By 1993, the service was being used in 9000 schools throughout Mexico, serving 600,000 students (15% of the secondary school population). By 1999, the use had grown to more than 900,000 students. The lessons are correlated to Mexico's Study Plans and Programs curriculum. Since 1994, the programmes have been broadcast on six channels of EDUSAT. Telesecundaria's leaders credit its success to the involvement of four groups: educational content providers, video producers, broadcasters and the users (teachers, students, families and work centre co-ordinators).

More recently, the Open Learning Agency in Canada introduced a similar service, using a combination of broadcast and videos for some courses and totally online delivery for others. Open School (www.openschool.bc.ca) promises "education anywhere anytime" by providing courses and resources that support educators of students in grades K–12 "in the Province of British Columbia, across Canada, and around the world." Open School provides a full range of course offerings that meet all the curriculum requirements of British Columbia. The resources can be used by teachers and home instructors in their entirety or can be adjusted to meet the needs and learning styles or other circumstances of the students. Parents are also encouraged to use the resources to encourage independent study and collaborative class work. Students can access resources they might not otherwise have available.

In India, a commercial venture, Infrastructure Leasing and Financial Services Ltd., plans to use ICTs to expand the reach of education, enhance the learning process, and catalyse continuing education through non-formal and vocational processes (IRC, Jan. 23, 2001). Schoolnet India (www.schoolnetindia.com) is developing learning programmes for grades K–10 to supplement the current educational system by aiding teachers in their pedagogy. Benchmarked to international standards and delivered over the Internet, the learning programmes will consist of banks of lesson plans, multimedia resource kits, links to other educational resources and programmes of teacher training. There is a six-year plan for full integration of Schoolnet India into the school system.

Another Schoolnet project is being explored for Africa (IRC, Jan. 22, 2001). On that continent, the "digital divide" is more severe than anywhere else on earth. In 1999, there were only about 100,000 dial-up Internet accounts in all of Africa for a population of about 700 million. Schoolnet Africa hopes to lessen the divide and stop the marginalisation of the people of Africa in today's knowledge-based global society. The plan is to establish local Schoolnets in more than half of all African countries by 2005 and to connect all schools in Africa by 2020.

This continent-wide initiative will complement the nascent efforts already underway in a few countries in Africa. Namibia has a Kids-on-the-Block programme to teach computer skills to youth who, in turn, provide support to Schoolnet schools. This programme is partially supported by a local pizza store. Tunisia has created EDUNET, which connects 350 secondary schools (87% of the total), 50 technical schools and 500 primary schools to the Internet. In Namibia, the National Museum of Namibia has joined with 51 corporate sponsors with a goal of connecting all schools to the Internet by 2004. Nigeria instituted an Education Tax Fund that imposes a 2% tax on individuals. The fund, some part of which will go towards ICT education projects, supports the development of quality education.

In the U.S. state of Florida, the Department of Education launched The Florida Online High School (www.fhs.net) in 1997. Using the motto, "any time, any place; any path, any pace," the school provides students in grades 9 to 12 with high-quality technology-based educational opportunities. The school's courses are tied to Florida's "sunshine standards," the state's academic standards. They are provided free of charge to any high school-age Florida resident. The student is responsible for the cost of a computer and Internet access, but the school will lend the student the textbooks and any specialised software that might be required for the courses. Currently, students enrol in the Online High School through their local school districts and receive their diplomas from the local districts. The school has applied for accreditation from the Commission on International and Trans-Regional Accreditation (CITA) (www.sacs.org/ pub/CITA/ intro.html), and will also be accredited by the Southern Association of Colleges and Schools (www.sacs.org) as soon as it receives CITA accreditation, which is expected in June 2001.

Development of the Florida Online High School has been swift. By the 2000/2001 school year, the school was offering 56 courses online to 6000 students. About half the students took the courses in their homes and half in computer labs provided by local school districts. The school expects to add about 10 new courses each year over the next few years. A cause of major concern in the first year, a 50% course dropout rate, has been addressed with some success, resulting in a 30% dropout rate during the second year.

In recent years, some tertiary institutions in the U.S. have formed virtual high schools. Towards the end of 1999, two U.S. universities started diploma-granting virtual high schools (Carr, Dec. 10, 1999). The University of Missouri and Indiana University had been offering correspondence courses to high school students for decades. Now, with accreditation from the North Central Association of Colleges and Schools, they serve students online who have not succeeded in traditional high schools, do not want to go to traditional high schools or who are being home-schooled. Financially independent of their founding universities, Indiana University High School (http://indiana.edu/~iuhs) and the University of Missouri at Columbia High School (http://indepstudy.ext.missouri.edu/MUHighSchool/Hshome.htm) will support themselves through tuition — $85 per semester course at Indiana and $90 at Missouri. The courses are designed by the universities' course developers.

In launching these virtual high schools, Indiana and Missouri join the University of Nebraska, which formed a for-profit company, Class.com, to sell high school courses over the Internet. Through Class.com (www.class.com) high school students can take individual courses or work to complete a high school diploma. The fully accredited courses are offered through the Independent Study High School (ISHS). Almost 50 courses are offered online and another 130 through correspondence. In addition to courses, Class.com offers a full suite of teacher support and technical support to help students get the most out of their learning experience.

A nationwide consortium of U.S. school districts, with partial support from commercial companies such as 3Com, Compaq and Lotus, has developed the Virtual High School Project (http://vhs.concord.org/home.htm). VHS does not itself grant diplomas, relying on the participating schools for that. In exchange for contributing a small amount of teaching time, a high school (grades 9 to 12) in the collaborative can offer its students NetCourses from other participating schools. The courses range from advanced academic courses to technical and specialised courses. Each school can enrol up to 20 students for each course a teacher contributes. Quality of teaching is maintained by requiring each teacher to successfully complete The Teachers Learning Conference, a graduate-level NetCourse designed to give participants exposure to the best educational strategies and technologies for NetCourse teaching.

Early in 2000, Bob Jones University (www.bju.edu) announced that it would offer satellite-delivered courses to Christian high schools and home-schooled students (Carr, Mar. 10, 2000). Schools quickly responded, with 41 purchasing the mathematics and science courses. Most of the participating schools are small institutions that can't find or afford enough teachers to offer a full curriculum. The schools pay $11,900 per year for a package of up to six courses.

NEW SUPPORT ARRANGEMENTS

One characteristic of distance and flexible education is a renewed focus on the student and an orientation to providing appropriate instruction for varying student learning styles and circumstances. Since this topic is dealt with in another chapter of this book (see Chapter 5), only the aspect of student support is addressed here because it has given rise to one new organisation and new programmes in existing institutions. Because some adult learners have accumulated significant learning through their careers and independent study, distance educators have begun to develop ways to recognise and accredit that learning.

In the U.S., the Council for Adult and Experiential Learning (CAEL) (www.cael.org) has a highly regarded history of helping tertiary institutions establish procedures and policies that provide credit-equivalents for student prior learning. Through Prior Learning Assessment, CAEL provides a means for students to:

- Validate the worth of learning they have achieved on their own.
- Understand what they need to learn in order to achieve their personal, career or academic goals.
- Shorten the time necessary to earn a college credential.
- Save money by reducing the number of courses they need to take.
- Enhance their pride and self-esteem for what they have accomplished as learners.
- Become aware that learning is a lifelong process.

CAEL now offers an online certificate in Prior Learning Assessment in conjunction with DePaul University. In Canada, the Open Learning Agency provides a similar service to learners and also offers an online certification programme for Prior Learning Assessors (www.ola.bc.ca/pla).

A variation on helping students obtain credit for their prior learning is the College Level Equivalent Program (CLEP) (www.collegeboard.org/clep). CLEP exams are recognised by almost 3000 of the 4000 tertiary institutions in the U.S. They are particularly used by military members in the U.S. to obtain university credit for learning they have obtained through military training programmes.

It is doubtful that any of these institutions or programmes would exist without distance education.

Consortia of Institutions

The neural nature of the World Wide Web might lead to the assumption that it would lend itself nicely to consortia efforts among educational institutions. But this has often not been the case. Many attempts to create consortia for distance education projects have ended in failure (see the sidebar on California Virtual University, below). In some cases, the non-equal status of the parties has been a problem. If one party is the "provider" and the other is the "beneficiary" of new services, it is difficult for the parties to form a consortium as equal participants. In other cases, it might be difficult for all the stakeholders to agree on the terms of the project since they approach the need from different points of views. In yet other cases, the parties might not share values on the topic (see the discussion on the disintegration of the draft agreement between News Corp. and various universities for the establishment of Universitas 21, below).

Nevertheless, there are examples of successful consortia of tertiary institutions for distance education. Some successes go unreported in the literature. They might consist of two neighbouring institutions agreeing to cross-enrol students in distance education courses and then agreeing on which courses each would offer. Others might be "mature" arrangements that have existed for several years and no longer make the news, such as Going The Distance (GTD) Project offered by the Public Broadcasting Service (PBS). In that case, more than 200 community colleges have joined with 67 public television stations in 41 states to offer associate degree programmes through distance education telecourses (www.pbs.org/als/gtd/project/index.html). The project is aimed at expanding career opportunities for working adults who could not otherwise attend college, and increasing workforce competitiveness through adult education services. PBS has offered telecourses through PBS stations and local colleges since 1981, but students could not complete degree requirements until the GTD Project was started in 1994. Enrolment in PBS telecourses has grown from 55,000 in 1981 to 400,000 in 1996 (NCES, 1997).

In a story of inter-institutional collaboration for distance education in the U.S., Carnavale (May 19, 2000) compares the models of distance education developed by the Western Governors University (www.wgu.edu) and the Southern Regional Education Board's Electronic Campus (www.sreb.org). Both institutions span huge geographic regions but their approaches and records differ. Each evolved from existing groups of institutions and a regional organisation with years of history of encouraging co-operation among the institutions. The Western Governors University evolved from the Western Interstate Commission on Higher Education (WICHE) (www.wiche.edu) an organisation founded in 1953 to facilitate policy development and co-operation among the tertiary institutions in 15 states in western U.S. The SREB, founded in 1948, facilitates policy development and co-operation among the tertiary institutions in 16 states in southern U.S.

Western Governors University (WGU) draws heavily from the course offerings of its participating universities. It has promised to introduce systemic change in higher education by offering degrees and certificates "based completely on competencies," for which the university has developed a new competency-based testing system. WGU would compete with programmes offered by existing colleges but gears its academic programmes especially for "people whose experience and expertise has [sic] outpaced their education." WGU offers associate degrees in Business and Information Technology, a bachelor's degree in Business Information Technology and a master's degree in Learning and Technology. The university provides online library services and refers students to amazon.com, the online bookstore, for bookstore services.

The Southern Regional Education Board (SREB) aims to give students easy access to online courses offered by its participating colleges through its Electronic Campus (www.electroniccampus.org). Through the Electronic Campus, more than 300 colleges are offering over 3500 courses per year, leading to about 150 degree programmes. Online library services are provided by GALILEO (Georgia Library Learning Online). The Electronic Campus has started an Academic Common Market Initiative to establish a single tuition rate for students no matter where they take their online courses within the Electronic Campus. The Campus also hopes to form a "regional learning network," a single gateway to all online tertiary education in the region.

According to Carnevale (May 19, 2000), so far Western Governors is falling short of its targets and is running a deficit, having enrolled only 200 degree-seeking students, while SREB has more than 20,000 students taking online courses at its member institutions. Those same numbers were projected for WGU earlier in the year (Carr, Jan. 14, 2000). WGU organisers had projected 500 students in degree programmes at that point, 3000 students in certificate programmes, and 10,000 taking courses at other institutions through WGU. Those numbers did not materialise, and the success of WGU remains to be seen.

Four-year public institutions are not the only tertiary institutions forming consortia to offer distance education courses and programs. McMurtie (May 12, 2000) reports that 24 of the 28 Jesuit institutions in the U.S. had joined forces to offer online courses through a new network, Jesuit-NET. They planned to translate the Jesuit-style of education, which emphasises personal instruction and attention to ethical issues, to cyberspace. The network would not offer courses itself, but would act as a "portal" for participating colleges to market their online programmes. Initial focus of Jesuit-NET would be on graduate-level courses.

The state of Kentucky has taken a unique approach to encouraging faculty members to develop creative approaches to distance education. It could lead to consortia arrangements among institutions or co-operative courses among faculty. In fall 2000, the state announced that through Kentucky Virtual University (KVU) (www.kcvu.org) it would set up a $1.5 million fund to jump-start online learning programmes by giving interest-free loans to professors starting online projects (Young, Nov. 24, 2000). Loans could range from a few thousand dollars to several hundred thousand dollars. Unlike grants from a foundation, KVU will work closely with loan recipients to help them succeed.

ONE VIRTUAL UNIVERSITY effort that was started about the same time as Western Governors University and was seen as a potential competitor has already ceased operations. California Virtual University (www.california.edu) started with plans to become a degree-granting entity, but failed to obtain sufficient funding. It had been hoped that each of the founding partners (the three California public university systems and the state's association of independent colleges) would contribute $1 million per year for three years to cover operating expenses. When those funds failed to materialise, plans to develop the university were scrapped. All that remains is a searchable database of distance education courses offered by over 100 California institutions (Hutton, 1999).

A very ambitious multi-university distance education venture has been launched in the United Kingdom. The Higher Education Funding Council for England (HEFCE) commissioned the consulting firm of PricewaterhouseCoopers to design a model that would allow all the universities in the U.K., in partnership with the private sector, to create a repository of quality distance education (online) courses and course components (HEFCE, Feb. 2001). The "e-University" (www.hefce.ac.uk) will be owned by the higher education sector and will draw content and services from existing higher education institutions (HEIs). An operating company will be formed to run the e-University. Initial response from the HEIs was strong, with three-quarters expressing their general support for the model. Response from the private sector was equally strong, with 91 companies responding to an initial advertisement for partners. The Secretary of State for Education and Employment announced that the government had provided £62 million over a three-year period to launch the project. The extensive report from PricewaterhouseCoopers (Oct. 2000), also supported by the government, will provide the roadmap for the launch of e-University. That report encourages the participating institutions to "be willing to explore new paradigms of teaching and learning that make full use of the technology ..." anticipating that this "... will fundamentally change the approaches to teaching and learning."

Another distance education venture in the U.K. was launched to meet the needs of a more narrowly targeted audience. The University for Industry (later renamed "learndirect") will provide workforce training in targeted skills areas and for particular industries. Aimed at secondary school graduates who finished school least well equipped for the workforce, learndirect (www.learndirect.co.uk) will deliver most of its services (employment information, advice and training) online. However, since most of its target audience has neither computers nor Internet connections at home, learndirect will create many hundreds of computer-equipped learning centres in friendly places such as pubs and shopping centres. Learndirect is seen as complementary to e-University.

Commercial Initiatives

Distance education, once the stepchild of higher education, has suddenly become an attractive area financially. The expectation is that distance education programmes can be not only self-supporting but can generate additional funds to support other departments at a traditional institution or can generate a profit for a commercial company. Recent years have seen several companies create corporate universities, mainly to educate their own workers (Meister, 2001) Other commercial companies have developed distance education ventures. Some provide services to support distance education and training programmes operated by traditional institutions. Others form partnerships and alliances with traditional universities. And, on occasion, some traditional universities form their own commercial subdivisions to offer distance education courses and programmes.

CORPORATE UNIVERSITIES

Many large, multinational corporations have created their own "universities." Often started as a vehicle for managing the training of employees and/or customers, these corporate universities are sometimes larger and better funded than traditional universities. For example, Motorola University has a staff of 700 and an annual budget of $150 million (Cunningham et al., 2000) It provides 40 to 120 hours per year of work-related training to every employee of the company. (Engineers and management receive 120 hours; salaried employees receive 40 hours.) Arthur Anderson Professional Learning operates with an annual budget of $382 million and a staff of

180, providing an average of 133 hours per year of training per employee. The goal of their training is to improve the business capacities of all staff. McDonald's University spends about 8% of the company's total payroll each year to train the workforce to provide consistency of product and service in an industry that experiences a 40% turnover of employees each year. Sun Microsystems Educational Services has a staff of 77 and spends $280 million per year on 92 hours of training per employee.

There is little doubt that some corporate universities are becoming competition to traditional higher education institutions, siphoning off students who might otherwise take college courses in management, production techniques, finance, marketing and other business-related subjects. Often, the students choose the "convenience" of the corporate courses over the "brand prestige" of the traditional university courses. This is causing some traditional institutions to reassess how they organise, deliver and market their courses. Sometimes the reassessment reaches to the very core of the university, raising questions of the institution's goals (e.g., educating the "whole person" vs. providing more "targeted" instruction), the institution's governance (e.g., strong administration that is able to implement change quickly vs. the more collegial approach of most traditional institutions) and the role of the faculty (e.g., "sage on the stage" vs. "guide at the side"; full-time vs. part-time).

Most of the corporate universities use a combination of pedagogical approaches. Face-to-face instruction remains an important component, although it is increasingly accompanied by ICT-enhanced instruction, especially in the case of corporations that have staff scattered throughout the world. Face-to-face instruction is especially used for courses that require "team" activities such as management courses designed to encourage collaboration among managers. None of the corporate universities uses ICT-delivered instruction alone. Printed workbooks, audiotapes and video remain the primary means for non-instructor-led training in most corporate universities.

The literature indicates that many corporations are turning to ICT enhancement of their courses as a vehicle for saving money. Although they spend substantial amounts to create ICT course materials, for example ranging from $100,000 for an eight-hour course at Michigan Virtual University to $4 million for a 45-hour course at Arthur Anderson Professional Learning, the amount saved in travel and "lost opportunity costs" more than offsets the cost of developing the materials.

One example of a corporate university might be particularly relevant for developing countries. In the early 1990s, Ford realised that it needed to upgrade its workforce to enable it to deal with the increasingly computerised nature of its cars. The workforce of 350,000 is scattered throughout 200 countries. The company found that the literacy skills of the workforce were not up to the requirements of print-based training, and its independent dealership network was averse to training.

Ford decided to overcome these barriers by video training that would "piggyback" on an existing but under-used satellite network that was used for data transmission to the dealerships. Ford invested $100 million to create FORDSTAR, its educational arm, and that did not include the cost of curriculum development or the $7000 each dealer had to invest in a satellite receive dish and recording equipment. Unlike most universities, Ford was in a position to compel training of its employees and dealers. Today, FORDSTAR operates on $440 million per year (2.5% of its payroll) to train its engineers, repair technicians, managers and sales staff in the dealerships.

Few, if any developing countries will have funds to match Ford's resources, but they can learn from the example of piggybacking on the existing resource of the satellite network. Ford leveraged the satellite investment to provide a value-added service. Developing countries might ask themselves:

- What resources exist on which a virtual education programme might piggyback?
- Do any multinational companies have unused delivery capacity that they might contribute to the cause?
- Are there training resources that might be expanded to become a backbone of a virtual education programme?
- Are there other existing resources that could be leveraged to give the virtual education programme a boost?

UNIVERSITY-BUSINESS ALLIANCES

In recent years, it has been common for tertiary institutions and businesses to form alliances to develop and deliver distance education courses. This trend is expected to continue into the future, at least in North America. In some cases, this involves new relationships between an existing institution and an existing business. In other cases, it involves the development of new companies.

One of the biggest stories of distance education partnerships worldwide has been a venture of Universitas 21 (www.universitas.edu.au), a network of 18 prestigious universities in 10 countries (Maslen, June 2, 2000; Shecter, 2000; *Chronicle of Higher Education*, Dec.15, 2000). Universities participating in Universitas 21 include Albert-Ludwigs University Freiburg, Fudan University, Lund University, McGill University, National University of Singapore, University of Auckland, University of Birmingham, University of British Columbia, University of Edinburgh, University of Glasgow, University of Hong Kong, University of Melbourne, University of Michigan, University of New South Wales, University of Nottingham, University of Peking, University of Queensland and University of Toronto.

In June 2000, the Universitas 21 group announced that it was joining forces with Rupert Murdoch's News Corporation to capture a major share of the growing global market for online higher education. Aimed at college graduates, the online courses would lead to advanced degrees awarded by the Universitas 21 institutions. The institutions would provide quality assurance, assess student performance and award degrees. News Corporation would use its global distribution platforms, advanced technologies and marketing skills to distribute the courses. The new joint venture was expected to begin offering courses in mid-2001.

Towards the end of 2000, that agreement fell apart and the Universitas 21 group announced that it would be working with Thomson Learning (www.thomsonlearning.com) to develop online learning materials. The publisher would be responsible for course design, testing, student assessment and student database management. The universities would award the degrees. However, within days of that announcement, the University of Toronto, one of the Universitas 21 participating members, began to distance itself from the joint venture. The reasons were not entirely clear, but a university spokesperson said the action was being taken to "protect the integrity of its brand."

By early 2001, the path for Universitas 21 had become even rockier. On March 2, Maslen wrote that five faculty unions from around the world had called on the universities in Universitas 21 to hold off establishing the arrangement with Thomson until all academic and employment issues were resolved. A week later, the *Chronicle of Higher Education* (Mar. 9, 2001) reported that students at Australian colleges had attacked the plan to create Universitas 21, charging that the reputations of the participating universities involved would be threatened. The National Union of Students backed protesters who demonstrated outside Queensland University's governing-council.

Nevertheless, a couple of weeks later the participating institutions were preparing to make substantial financial commitments to the new consortium (Illing, 2001).

Whatever the outcome of the Universitas 21 partnership agreements, they reflect the condition of distance education at the tertiary level at the start of the 21st century. Institutions are anxious to form new partnerships to reach new populations. Businesses see the universities as sources of intellectual assets needed to develop distance education offerings. Universities recognise that the businesses are experienced in developing, distributing and marketing products to mass markets. Both sides are struggling to devise relationships that would draw on the strengths of each to create and deliver new products to meet the perceived needs of vast populations of adult learners.

There are other examples of university-business partnerships or alliances that hope to achieve results similar to the Universitas 21 group. For example, in an article entitled "How a Publishing Empire is Changing Higher Education," Blumenstyk (Sept. 8, 2000b) reports that London-based Pearson PLC (www.pearson.com), perhaps the world's largest educational publisher, has developed high-profile relationships and deals with many prestigious universities, including Cambridge, Regents College (now Excelsior), and the University of Michigan, as well as other educational businesses such as America Online and Blackboard. Part of Pearson's plan is to create a giant online venture called the Learning Network, which it will house with its corporate education assets and other distance education assets in a subsidiary known as FTKnowledge. That subsidiary already generates $110 million a year in revenues for Pearson, and it is pegged to grow to $300 million to $500 million in three to five years.

Blumenstyk observes that the Pearson programme reflects the fact that "higher education is now a hot commodity in business circles." She speculates that this programme and others from Pearson competitors Houghton Mifflin, McGraw-Hill, Thomson, Harcourt and John Wiley, might force universities to choose between joining these corporations in joint ventures and trying to fight them. If they choose to fight, universities might find themselves focusing on less lucrative liberal arts programmes while the businesses capitalise on more lucrative adult education markets.

Simultaneously, another major commercial provider of higher education, DeVry Institutes (www.devry.edu), received accreditation from the North Central Association of Colleges and Schools for online versions of its bachelor's degree programmes in business and information technology. These programmes are aimed at adult students who must be at least 21 years old and have completed 24 credits at a traditional institution. DeVry plans to charge $330 per credit hour for its online courses compared to $235 per credit hour it charges for classroom-based courses. Although online students need only 124 credits for degree completion compared to 132 needed for classroom-based programmes, the online degree will cost about one-third more than a classroom-based degree.

Some of the commercial distance education ventures undertaken by tertiary institutions have been narrowly targeted at specific populations. For example, Pace University joined with the National Advisory Coalition for Telecommunications Education and Learning (NACTEL) to create and offer an associate degree in Telecommunications (http://csis.pace.edu/nactel) aimed at workers who want to fill Network Technician jobs in industry (Virtual Gazette, 1999). The courses are offered exclusively via the Internet from Pace University. The specially designed curriculum meets academic standards and reflects state-of-the-art practices in the industry. NACTEL is a consortium of four communications companies (Bell Atlantic/Verizon, GTE, SBC and U.S.

West) and two communications unions (CWA and IBEW) that together have over 350,000 telecommunications workers. The degree programme is funded by the Alfred P. Sloan Foundation and administered by the Council for Adult and Experiential Learning (CAEL).

Another example of a university-business partnership that is narrowly focused is the OpenTech project of the Open Learning Agency in Canada (www.ola.bc.ca). With sponsorship from Oracle Corporation, Cisco, Microsoft and others, OpenTech offers students a combination information technology certificate plus college credit.

Not all the partnerships are focused on for-credit distance education courses. A consortium of six medical schools, known as the University Pathology Consortium (http://upmd.com), created a new Internet service in 2000 to help health-care professionals diagnose and test for a variety of diseases (Mangan, Sept. 22, 2000). The consortium contracts with 150 professionals around the country to review and update the information it places on its Web site. The service is marketed to physicians and other health-care professionals for an annual subscription fee of $199.

If one doubts the extent to which commercial interests view distance education as a large potential market, one need only pick up any issue of *The Chronicle of Higher Education* and study the display ads. Consistently throughout 2000, at least half of the display ads in each issue were touting distance education-related products or services from commercial companies. JonesKnowledge.com normally had one to three pages of ads promoting its integrated campus software for distance learning. Blackboard and WebCT could be depended on for one or two pages each to tout their integrated online systems. Jenzabar often took a full-page ad to promote its integrated online campus software. Harcourt e-Learning promoted its online courses with full-page ads. Other distance education service providers such as Datatel ("Campus Cruiser"), PeopleSoft (student records and support software), Mascot Network (student online centres to foster communication) and Academic Systems (online courses) periodically took out full-page ads. Still other companies that support distance education, such as Macromedia (Web design software and tools), DigitalLearningInteractive (online textbooks), XanEdu (online resources for faculty and students) and Prometric (online testing) often took out large but less than full-page ads to promote their services. It should be clear from this that colleges are experiencing significant competition for functions that used to be exclusively theirs. On the other hand, the proliferation of such delivery and support platforms provide colleges with the opportunity to unbundle and outsource various components of the educational process. This is a trend that began to emerge in the late 1990s.

Not all university-business partnerships have gone well. The online-course company Global Education Network (GEN) (www.gen.com) approached 15 elite liberal arts colleges about collaborating to sell online courses (Carr, Aug. 18, 2000a). Wellesley signed a contract, but none of the others followed. Brown University and Williams University allowed individual faculty members to create courses for the company, and Brown and Duke universities were still considering some sort of an institutional arrangement with GEN, but Harvard, Princeton, Stanford and the other institutions were unlikely to enter into any agreement.

History was even harsher on Bigwords.com. Only four months after announcing its commencement, with $30 million infusion of venture capital, this online college bookseller quietly exited the business (*Chronicle of Higher Education*, Nov. 17, 2000). Although Bigwords.com attracted 800,000 users a day to its Web site, that did not translate into sales or profits. VarsityBooks.com, another online college bookseller, was also struggling to stay alive. By the end of 2000, it had laid off two-thirds of its employees, including a Group Vice President (Irwin, 2000). These "reversals" for highly visible dot-com companies might lead some colleges and universities to be especially cautious about how fast they plan to grow their online offerings and the companies with which they partner to develop and deliver their courses and support services.

Some university-business arrangements were less direct than others. For example, Swarthmore sold its Web site, MathForum.com, to WebCT early in 2000 (Carnavale, Apr. 28, 2000). Started in 1996 by Swarthmore math professor Gene Klotz with $3 million funding from the National Science Foundation, MathForum (www.mathforum.com) had become one of the most popular math sites on the Web. Using "Ask Dr. Math," students could learn how to multiply fractions, solve differential equations, and other math functions. WebCT will use the MathForum model to develop other forums in subjects such as biology, history, and English.

Another example of subtle alliances is the phenomenon of colleges and universities paying commercial Web sites to list their online course offerings (Carr, Apr. 14, 2000). Portals such as Hungry Minds (www.hungryminds.com), where potential students are likely to search for information about available courses, charge the universities a fixed fee or referral fee of 10% to 20% of the tuition collected from referred students. Institutions such as the University of Maryland and the University of California at Berkeley have already signed on. As an alternative to arrangements such as this, some groups of universities, such as Western Governors University and the Southern Regional Education Board's Electronic Campus, are forming their own portals. Sceptics are waiting to see if the portals can prove their value by delivering students. The jury is still out at this early stage of the evolution of these Web sites.

FOR-PROFIT UNIVERSITY SUBSIDIARIES

Not all of the new commercial ventures undertaken by tertiary institutions for distance education involve alliances with businesses. Some originate and remain within the universities themselves. Administrators at Cornell University, for example, saw a sizeable market for high-level courses taught at a distance through e-mail, discussion boards and CD-ROMS (Manjoo, 2000). The university formed a for-profit entity named e-Cornell (www.ecornell.com). And, taking a cue from the business world, Cornell decided to motivate e-Cornell's leadership to capture the market by giving them a share in the profits of the company.

The story of e-Cornell, however, illustrates a difficulty of grafting new e-commerce onto the academic trunk of an existing tertiary institution. One catch in the e-Cornell planning was that the university's administration created the new company without consulting the faculty. When they learned of the new company and the plans for it, some of the faculty rebelled. They claimed that they were not against distance education but they wanted to discuss how it could fit into Cornell's academic culture. Citing competition from peer institutions and private businesses, the administration pressed forward in spite of faculty objections. Most of the faculty seem resigned to co-exist with the new company, sharing the common belief that if it is not e-Cornell, some distance education programme will be started soon by the university.

Other tertiary institutions have also created for-profit subsidiaries to develop and market distance education courses. In December 1999, Temple University created Virtual Temple to market online courses to reach more rapidly and efficiently the adult market (Carr, Dec. 17, 1999). Virtual Temple would contract with faculty from Temple University and other universities to use their courses. This follows a pattern set months earlier by New York University and Columbia University. Interestingly, as with e-Cornell, some faculty members at Temple complained that the university's administration had failed to consult with the faculty in developing the plan for Virtual Temple. One concern of the faculty was that the new corporation might "take jobs away from Ph.D.s and put them into the hands of business executives and poorly paid part-timers."

The University of Maryland University College (UMUC) also created a wholly owned for-profit arm to market its online courses (Carnavale, Dec. 17, 1999). UMUC OnLine (www.umuconline.com) will not create new courses but rather will market UMUC courses globally to extend the reach of the college's online courses. UMUC already offers 430 online courses, serving more than 20,000 students. UMUC OnLine.com will seek corporate partners, especially those who can bring innovative approaches for the delivery of the courses.

In an editorial column in *The American Journal of Distance Education*, Moore (2000) writes about the competition that for-profit companies are beginning to give colleges and universities in delivering programmes of higher education. He specifically mentions Harcourt Learning Direct, Hungry Minds, SmartPlanet, eHigherEducation, SmartForce, Jones International University and the University of Phoenix. He also notes that 1000 companies have set up their own in-house training programmes, doing for themselves something they at times turned to universities to do in the past. Moore goes on to identify public institutions that have entered the for-profit field themselves: New York University (NYU OnLine), the University of Nebraska (www.class.com) and Columbia University (partnering with Unext to build a new Ivy League Internet business degree according to Carlson (Dec. 1, 2000)). Such developments, suggests Moore, raise concerns that the proliferation of new institutions might lead to price wars between traditional tertiary institutions and for-profit universities, with the for-profit institutions picking the "low-hanging fruit" and leaving the less lucrative courses to the traditional institutions.

One phenomenon that has spurred some alliances between universities with distance education programmes and businesses is the trend to "unbundle" components of the education process, sometimes referred to as "disaggregation." Until recently, the education process within the university was a self-contained process, with the faculty member responsible for most of the process. Curriculum development, creation of course materials, delivery of instruction, student advising, testing, grading and accreditation would be done by the faculty member on behalf of the university. Other university personnel handled the rest of the process, including functions such as registration, bookstore, library, counselling, housing, food services, etc.

But some years ago, traditional higher education institutions began to unbundle and outsource some peripheral components such as food services and bookstore functions. The advent of distance education has led some institutions to question whether other components of the educational process could be unbundled. This opened up opportunities for businesses to provide some of those services, theoretically more efficiently and economically than the university could. It was not long before businesses started to provide library and bookstore services for distance learners. Companies such as Real Education (now e-College) soon offered to develop courses online and deliver the core parts of the courses to distance learners. Others, such as Prometric, began to market testing services. Yet other companies, such as Blackboard and WebCT, began to develop and market integrated educational packages that brought together almost all of the components of the educational process (course materials, tutorials, student-to-student contact, assessment, library resources, bookstore services and other student services) into a single platform.

Finally, companies such as Smarthinking began to offer the final pieces: tutoring and counselling services.

It is not clear where all of this will lead distance education. By no means have all institutions jumped on the "unbundling bandwagon." Yet it seems clear that the genie is out of the bottle and increasingly institutions will be asking which of the components they can "outsource" to others, while still maintaining the quality of their educational programmes.

Government-Education Alliances

The U.S. federal government has rather suddenly become a major potential player in distance education. Educational opportunities are seen as a key incentive for attracting and retaining recruits to voluntary military service. While the U.S. military has for years funded access for its members to traditional and non-traditional education opportunities, in 2000 several new programmes were launched by the Department of Defense and one or more of the branches of the armed services.

U.S. service members have the option of choosing from many forms of education. Tuition is paid by the U.S. government. One concern of the Pentagon is that various colleges and universities use different software applications and technology platforms for their online courses. With funding from the Defense Department's Advanced Distributed Learning Initiative (www.adlnet.org), several public universities in Wisconsin are compiling a set of voluntary technical standards for companies that make and sell software and platforms for online courses (Carr, Mar. 3, 2000). For example, the standards might call for Web pages to use authoring language XML rather than HTML. The goal of this project is to make it easier to migrate courses from one platform (e.g., Blackboard) to another (e.g., WebCT).

In August 2000, the U.S. Army announced what might be the largest distance education programme ever undertaken, planning to spend $600 million over six years to enable any interested service member to take courses on the Internet, at little or no cost, wherever they are stationed (Carr, Aug. 18, 2000). Through a Request For Proposals (RFP), the army would contract with a single "integrator" who would set up the technology to deliver the courses and would subcontract with colleges and universities that agree to use the system to offer their courses to service members. Eventually, the system could enrol a million students, solidifying the army as the largest broker and customer of distance learning in the U.S., and probably in the world.

By November 2000, colleges and companies had teamed up to vie for a role in the army programme (Carr, Nov. 17, 2000). At least six teams of corporations and colleges (the team being a requirement of the RFPs) submitted bids for the programme. For example, one team was headed by IBM and included Georgia Virtual Technical College, the Historically Black Colleges and Universities, Texas A&M University, the University of Maryland and the University of Oklahoma.

In the final days of 2000, the army announced its selection, picking PricewaterhouseCoopers as "integrator" for a $453 million, six-year project to deliver distance education courses to soldiers all over the world (Carnevale, Jan. 5, 2001). The project is named Army University Access Online. PricewaterhouseCoopers lined up a team of 10 companies and 29 colleges to work together on the initial offerings. The project was scheduled to begin operation early in 2001 and to enrol about 15,000 students within a year. PricewaterhouseCoopers' bid came in below the army's projected cost of $600 million, and beat out other companies such as IBM, NCS Pearson, Arthur Andersen, Computer Sciences Corporation, Electronic Data Systems and Science Applications International Corporation. Companies co-operating with PricewaterhouseCoopers include Blackboard, Compaq, Fiberlink, PeopleSoft, Intel Online and Smarthinking. Colleges spanned the spectrum from large universities such as Penn State, the University of Texas and Florida State University to two-year colleges such as Northern Virginia Community College, Rio Salado College and Anne Arundel Community College, to private colleges such as Nova Southeastern University, St. Leo University (FL) and St. Joseph's College (ME). Other companies and colleges will be added as the project progresses.

Meanwhile, the U.S. Navy had announced a programme to provide distance education college courses to its service members all over the world, again as a way to recruit and retain sailors (Carr, Nov. 17, 2000a). Unlike the army's RFP, the navy's did not require a single integrator. Instead, the navy chose 16 colleges and universities and plans to work closely with each, more like a partner than a contractor. Fifty-two institutions had applied to participate in the programme.

The navy programme is significant in at least two ways. First, only colleges offering complete degree programmes at a distance were eligible for consideration. Second, because many sailors are isolated on ships, the courses had to be available without Internet access; the navy was not interested in programmes that offer only online courses. Colleges chosen for a pilot programme include Dallas County Community College District, George Washington University and University of Maryland University College. Other institutions that will eventually work with the navy on the programme include Pikes Peak Community College (CO), City University in Renton (WA), Coastline Community College (CA), Embry-Riddle Aeronautical University (FL), Empire State University (NY), Florida Community College at Jacksonville (FL), Florida State University (FL), Fort Hays State University (KS), Old Dominion University (VA), Rogers State University (OK), Thomas Edison State College (NJ), Troy State University (AL) and Vincennes University (IN).

Driving and Constraining Forces for New Organisational Arrangements

The preceding sections of this chapter have described several examples of new organisational arrangements for ICT-enhanced virtual education. Some of the examples build on existing educational infrastructures; others create alternative structures. Some have been developed by existing educational institutions; others by players who are new to education, such as corporations. Some are seen as complementing existing educational offerings; others are intended to compete with what exists.

Some of the examples cited are from developing countries, but the majority are from the developed world. This is perhaps because developed countries are more likely to have the educational and technological infrastructures and financial resources needed to build ICT-enhanced virtual education. It might be, in part, because there is a more robust history of philanthropy in some parts of the developed world, especially the U.S. In many cases, foundation grants have allowed higher education institutions to explore and develop the potential of technology-enhanced virtual education.

It is hoped that even the examples from developed countries will benefit leaders and planners from developing countries by sparking in their imaginations visions of the possibilities that ICT-enhanced virtual education holds for their countries.

Embedded in the experiences of the described efforts are several forces that **drive** the development of new virtual education programmes and others that **constrain** that development. The same force that drives development in one environment might constrain it in another. In designing a "vision of the possible," these forces must be kept in mind. Each force is explored in the form of questions.

Societal and Institutional Needs

Many of the new virtual education organisational arrangements reflect strongly felt needs in a society or an institution. For example, the African Virtual University is being developed to address the lack of adequate tertiary opportunities in the participating countries. NYU Online is being developed to capitalise on the human resources (i.e., faculty talent) of the institution, using the technologies to reach and teach additional students. Often, the identified needs can best be met through partnerships or affiliations of two or more institutions.

- What are the needs of a *society* that might **drive** the creation of a new virtual education organisation (e.g., to provide equal access to higher education opportunities for all high school graduates of the country; need for new vocational and technical skills to strengthen the middle class population, as Taiwan has done; need to upgrade the workforce skills of the population in general; need to train today's professionals such as engineers and computer specialists to use new tools and procedures while they remain in the workplace, as France and Canada have done; to overcome the "tyrannies of space, time and fixed curriculum" [IGNOU] by offering flexible, anytime-anywhere learning; desire to encourage lifelong learning)? Can those needs best be met through the development of a new institution? If so, can that institution best function independent of all other institutions (as in the case of NYU Online) or might it benefit from working with one or more other institutions (as in the case of African Virtual University)?
- What are the needs of an *institution* that might **drive** the creation of a new virtual education organisation or programme (e.g., the imperative to expand its student population; a desire to extend its influence in one academic area such as the social sciences; a determination to use its resources, including personnel, more effectively; a quest for increasing "profit," especially in the case of for-profit institutions; a decision to capitalise on the institution's existing "brand" name)?
- What are the needs of a society or an institution that might **constrain** the development of a new virtual education organisation (e.g., a desire to maintain the status quo; faculty resistance to a new mode of instruction; lack of sufficient capital and/or human resources; a population that does not have the prerequisite skills to study independently; copyright laws that discourage the use of resources in distance education; a concern that the virtual education programme might dilute the value of the institution's strong "brand" name)?
- Are any of the identified needs being met by other institutions? If so, are the other institutions potential partners for the new institution? Potential competitors?

Learner Needs

In many cases, learner needs have played a major role in creating and/or molding new organisational arrangements. In developing countries, for example, although the term "distance education" is used often, many of the students live no more than 30 kilometres from a tertiary institution. In their cases, "convenience" is a more important consideration than "distance." Learner needs are also affecting the nature of the courses provided. Because many of the learners are adults who are in the workforce, they are demanding that the courses be practical and contain information and skills that they can put to work immediately in their jobs.

- Who are the learners who will be served by the virtual education programme or institution? Are they adults? Are they in the workforce? What are their expectations and educational needs? What study experiences and skills do they bring to their classes? What value do they place on learning?
- Who will pay for their education? Their employers? The government? If so, how much expendable income does the average student have?
- How can the new programme provide the learners with the flexibility (anytime, anyplace) and quality they seek?
- What information and communications technologies (ICTs) do most of the students have access to? If the virtual education programme uses ICTs for delivery, what impact will that have on access and equity of opportunity?
- Are there community resources (e.g., committed employers, local libraries, educated retirees) that the virtual education programme can draw on to support the learners?

AVAILABLE ACADEMIC RESOURCES

It is important for societies and/or institutions contemplating the creation of a new virtual education organisation to assess what resources they have available that could be committed to the creation of a new organisation or programme. Presence of academic resources might **drive** the development of a new institution or programme, absence of such resources might **constrain** development.

- Is there a cadre of qualified and highly regarded faculty who could develop and teach the virtual education courses? Is the faculty supportive of or resistant to virtual education?
- Is there an existing body of courses that are appropriate for the target students that could be adapted to ICT delivery?
- Is there a trained population of course developers and producers who can work with the academics to develop new courses? Is that population familiar with recent developments in instructional design and delivery?
- Are there policies in place regarding copyright and ownership of courses and course materials that would be developed for the virtual education programme?
- Are there existing institutions that might become partners or otherwise affiliated with the new organisation? Does it make sense to affiliate with others to spread the risk and attract new capital?
- Is there any role for existing secondary institutions to play in the new organisational arrangement?

AVAILABLE TECHNOLOGY INFRASTRUCTURE

An honest assessment of the existing technology infrastructure is essential. The virtual organisation will not be in a position to develop the technology infrastructure. It must ride on whatever exists. A strong infrastructure might **drive** new virtual education organisational arrangements, especially if there is unused capacity within the infrastructure. A weak infrastructure might **constrain** new virtual education programmes, even if the need is great.

- What technology infrastructures exist (including hardware, software, and support systems)? Is there a strong postal system? Nationwide radio broadcast system? Nationwide television broadcast system? Does the telephone system reach into most communities? Most places of business? Most homes?

- Are the technologies affordable by most of the population? If not, and if the new organisational arrangement is developed to address a national need, can special policies (e.g., new rate tariff) be created to make them available to the primary targets of the virtual education programme?
- Are there support services for the new technologies? Assuming that the technologies will be new to many of the target population, what will be done to assure that the infrastructure is usable and does not become a barrier?
- Are there infrastructure resources with unused capacity (e.g., the satellite that Ford used to create its FORDSTAR training network)?

UNBUNDLING THE EDUCATIONAL PROCESS

As has been discussed earlier, in recent years, institutions have begun to "unbundle" the package of services they offer and contract some to outside vendors. Any virtual institution created today must determine which services it will offer directly and which others might provide more efficiently or effectively. The ability to contract some services to outside vendors might **drive** the creation of new organisational arrangements for virtual education.

- Do virtual education students require the full range of services normally provided by traditional institutions? If not, which services are not required (e.g., sports facilities, food services, lodging)?
- Must the new organisation provide all the services itself? If not, which might it contract to outside vendors (e.g., bookstore, online library, registration, financial aid assistance)?
- Must the faculty of a virtual education programme be responsible for the same set of services as the faculty of a traditional institution? If not, which services might be provided by others (e.g., course development by a team rather than a single faculty member, assessment by a third-party measuring student skills and knowledge, student support by trained support desk personnel)?

QUALITY ISSUES

Establishing and maintaining qualitative integrity is critical to all the stakeholders of a new virtual education organisation: the funders, the administrators, the faculty, the students, and the regulators.

- How will quality of instruction and support services be monitored? Who will have responsibility? Will monitoring be ongoing or periodic (e.g., every five years)? What criteria will be used?
- What service areas will the quality control monitoring cover? As virtual education programmes cross geo-political borders, including national borders, how far will the quality control monitoring extend? If the world is the service area of the new institution, will quality control be worldwide? If so, will the standards vary to reflect different expectations in various parts of the world?
- How will the results of quality control monitoring be conveyed to the stakeholders?

TARGETS OF OPPORTUNITY

Sometimes new virtual education arrangements will lead to special targets of opportunity, providing occasions for developing new programmes or serving new populations. Such targets of opportunity can **drive** further development of the new organisation.

- Having established a new organisation or programme, is it now possible to serve additional groups of learners? If so, who are those learners and what are their needs?

- Can the new organisation or programme develop new academic programmes to meet emerging needs of the society?
- As new technologies become more widely available, do they permit the development of new programmes of study or reaching new groups of learners?
- Can the efforts of the new organisation or programme be used in other ways to serve the needs of the society (e.g., through the publication of a journal that shares new pedagogical approaches with other institutions or periodic research symposia to enable other institutions to benefit from what the new institution is discovering about learner support services)?
- How might the new organisation create a research and evaluation structure that is appropriate for its place in the overall educational system of the society?

Conclusion

There is a great deal of "churn" in virtual education today, which parallels the churn found in technology industries worldwide. That is not likely to change over the next few years. We can expect to see many new institutions and initiatives in virtual education. Some will survive; others will not. What seems certain is that virtual education will continue to grow and to change. Those changes that are tied closely to technology will require venture capital. The amount needed will usually exceed early estimates.

Many of the developments we can expect to see in virtual education over the next few years will involve partnerships and alliances of institutions, both within countries and across national borders. Those partnerships and alliances will allow the participating institutions to disperse costs and draw on each other's strengths.

To what extent the developments in technology-enhanced virtual education programmes benefit developing countries will depend, in large part, on the "vision of the possible" that leaders of those countries have and how they muster the resources of their countries to make their vision become a reality. It is hoped that at least one example cited in this chapter has sparked the imagination of each reader and that the references provided will allow the reader to follow up with educators who have already invested their time and talents to create virtual education programmes that can be the precursors those created in the developing countries.

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7

Quality Assurance

Ms. Andrea Hope

Introduction

As educational systems expand and develop to meet the needs of citizens in their jurisdictions, they are required to demonstrate that they are able to deliver significant improvements in terms of increased access, enhanced quality and reduced unit costs.

Open and distance learning (ODL) systems have generally been introduced during the past 40 years to meet the increased demand for educational opportunities at all levels by supplementing face-to-face provision while striving to balance the access-cost equation by reducing infrastructure and full-time faculty costs. The very features of flexibility and accessibility which make ODL an attractive option to the part-time adult learner, also mean that it has frequently been viewed with suspicion by conventional institutions and the public, who are more comfortable with the traditional face-to-face world of the institutional classroom. In such an environment, quality may be assumed to have been to a large extent assured by the qualifications of the full-time tenured faculty member, who has total control of the pedagogical process, and by the qualifications of the students at entry.

The best single-mode ODL providers have been acutely conscious of the need to devise processes that can assure the quality of learning outcomes and thereby defend the legitimacy of their programmes and awards. Dual-mode (distance and face-to-face) institutions, for their part, have been required to develop quality assurance protocols that demonstrate that their open and distance offerings are of equal quality to these offered in parallel by traditional classroom-based methods. To provide their stakeholders with the necessary reassurance, quality assurance protocols in ODL tend to focus on output measures which are able to demonstrate the value to the student by participation in the process. Large-scale, mature open universities such as the Open University in the U.K. (UKOU), Indira Gandhi National Open University in India (IGNOU) and the Open University of Hong Kong (OUHK), are systems-driven organisations. From their establishment, in order to gain acceptance in the higher education community, they consciously adopted and adapted quality assurance measures from the conventional sector and sought to demonstrate the rigour and dependability of the systems which underpinned the key educational processes: programme planning, course design, course development, course delivery and student assessment and award.

The rapid development and use of instructional technologies in both distance and face-to-face institutions since the late 1990s has resulted in a three-way convergence of distance and face-to-face education and electronic technologies.

In this new, flexible learning environment, the instructor or teacher is no longer the sole (or even the main) source of knowledge, but plays the role of facilitator, supporting active technology-mediated student learning. In cyberspace, the physical proximity of teacher and student is irrelevant, and group, one-to-one, and one-to-many interactions between student and student and students and teachers are freed from the tyranny of the fixed timetable by the capacity of Internet-based technology to provide opportunities for both synchronous and asynchronous communications.

The emergence of the new instructional paradigm means that all institutions that use information and communications technologies (ICTs) to facilitate the interaction of students with content sources, faculty support, information resources or other students, need to review and revise their quality assurance protocols to ensure that they are focusing on appropriate inputs, processes and outcomes. In an Internet-enabled environment, for example, the traditional measures of the size of institutional library holdings and access to databases need to be replaced by measures relating to the mechanisms for information provision and support for student's research work. Similarly, in a disaggregated environment where the instructional design process and the provision of technical support and tutorial services may have been contracted out by the institution to commercial providers, it is no longer appropriate to rely solely upon the procedures for full-time faculty appointment, development and promotion to provide reliable indicators of overall academic quality. Instead, one is looking for evidence of mechanisms put in place by the institution to ensure that its staff at any time are competent for all the tasks required of them and that the procedures for contracting out services are informed by an understanding of best practice in each domain.

Robin Mason sums up the enormous shift in definitions of quality that has already taken place as a result of the massification of higher education by reference to the issue of access. "No issue so exemplifies the relative nature of educational standards as the subject of access. Where once the quality of an educational programme was defined by the number of students it turned away, in today's lifelong learning climate, equality of access to the traditionally disenfranchised is a much more highly regarded attribute than exclusivity" (Mason, 1998).

The technological developments that have led to the convergence of face-to-face and distance learning, and the emergence of a new flexible learning environment for on- and off-campus students of single- and dual-mode institutions, have also facilitated the emergence of providers of educational services that are dedicated to online learning: virtual schools, colleges and universities that offer the opportunity to study anything, anytime, anywhere.

This chapter seeks to explore the imperatives for the development of new modes of quality assurance mechanisms in response to the global online learning phenomenon. It also reviews the results of significant research that has been conducted worldwide in an attempt to develop quality standards and accreditation frameworks to meet the needs of the institutions and the students and that, in turn, influence policy development in the field.

In order to flourish against global competition, both the public and privately funded e-learning institutions need to establish their credentials within their niche in the new global education marketplace. Potential students need reliable indicators of quality to enable them to navigate the increasingly bewildering array of courses and programmes on offer, without falling victim to unlicensed "Web-cowboy" operators, who, like their disreputable precursors, the "diploma-mills" of the age of correspondence courses, may fail to live up to the promises they make and bring the whole new world of technology-mediated distance learning into disrepute. John Randall, chief executive of the U.K. Quality Assurance Agency for Higher Education (QAA), speaking of transnational education at university level, suggests that "individual decisions...to participate in transnational higher education are driven by history, language, cost and recognition. Recognition of the qualifications gained, by governments, employers or professional bodies, is the single most important consideration for the individual" (Randall, 2001). It is therefore imperative for institutions and for agencies involved in the accreditation of courses to seek to develop what Randall describes as a "global currency for higher education qualifications" based upon an evaluation of learning outcomes by reference to generally agreed standards of achievement at defined exit levels. The generic performance indicators proposed by Randall and paraphrased below reflect the current preoccupations of quality assurance agencies seeking to ensure that today's graduates possess the skills and competencies necessary to enable them to become knowledge workers in a global economy. As such, they provide a useful point of reference in the consideration of quality assurance in the specific context of technology-assisted learning. They have been included as a reminder that while there are specific quality issues arising from the use of technology as a medium of teaching and learning, the same fundamentals of educational best practice must be in place whatever mode of delivery is chosen. This has also been well expressed by the New Zealand Universities Academic Audit Unit (NZAAU) (Butterfield et al., 1999), whose guidelines on External Quality Assurance for the Virtual Institution warn its auditors against "too narrow a focus on a specific medium of teaching and learning, as what (the academic quality review process) is aiming to find out is independent of the medium."

Thus, for any course or programme, irrespective of the mode of delivery, an institution must be able to demonstrate that:

- Learning outcomes have been set at the appropriate level and clearly communicated to students.
- Content and design of the curriculum and the teaching methodologies employed are effective in enabling the student to achieve the outcomes in terms of both the acquisition of knowledge and the development of related practical skills and abilities.
- Assessment is appropriately designed and rigorously administered to measure the achievement of the outcomes.

The Need for Quality Assurance in Online Education

PROTECTING LOCAL PROVIDERS IN A GLOBAL MARKETPLACE

The application of new technologies in the learning environment is not only removing the distinction between conventional and distance education, it is also eroding political and geographical barriers to the movement of knowledge. Whereas within frontiers at the state (e.g., U.S.A., Canada), national (e.g., South Africa, New Zealand) or regional (e.g., E.U.) level, structures exist for the regulation or self-regulation of educational activities, there has traditionally been less regulation across frontiers and there is certainly less still in cyberspace. The growth of the export trade in educational products during the last 10 to 15 years has alerted countries which are net recipients of such products that there is a need to erect barriers in order to safeguard their citizens and institutions against the worst excesses of some entrepreneurial providers, whose major concern is the financial bottom line rather than the educational experience of the students on the course. Butcher and Welch (1996) describe the problem in Nigeria in graphic terms: "Adventurous entrepreneurs see a juicy field of operation because of the imbalance of demand and supply with a ready market for ever-increasing applicants who are desperate for educational qualification through correspondence measures."

While limited access to the appropriate technology may continue to provide a barrier to Web-cowboys in Nigeria, the same is not true of Hong Kong. As one of the traditional net importers of higher education, Hong Kong's response has been to pass the Non-local Higher and Professional Education (Regulation) Ordinance (1996) which requires all overseas providers, not operating through accredited Hong Kong institutions, to register with the government and to meet the stringent quality criteria required for registration (www.hkcaa.edu.hk). Nevertheless, these mechanisms cannot be applied to institutions which operate globally online and have no physical or legal presence in Hong Kong.

Australian universities have been among the most aggressive exporters of educational products to the Asian market in the 1990s. In her paper "Higher Education as a Business: Lessons from the Corporate World" (2001), Yoni Ryan describes how Australia has acted to protect the "brand" of Australian universities against incursions from cyberspace by publishing National Protocols for Higher Education Approval Processes (www.detya.gov.au/highered/mceetya_cop.htm). The protocols provide for virtual universities to be prosecuted in the jurisdiction in which their operations have an adverse effect as well as in their home jurisdiction and make it illegal to use the term "university" in Australia without formal accreditation by state government agencies. As Ryan points out "it is apparent that, in Australia at least, government has asserted its right to regulate borderless education."

While protecting local institutions from the threat posed by the global ambitions of entrepreneurial off-shore institutions, such legislation may, paradoxically, increase the risk to the unwary individual student that the credentials earned through participation in an online course may not be recognised for further study or employment in the participant's country, even though the institution which offers the course may be accredited in its own home jurisdiction. The increasingly global nature of educational provision therefore brings with it a need and a market for consumer advice about what to avoid and what to choose in terms of technology-mediated learning opportunities to make sure that they live up to the claims of convenience, relevance and interactivity that are often made for them.

PROTECTING LOCAL CONSUMERS AND PROMOTING LOCAL VALUES

In response to the need for guidance on how to select reputable and appropriately accredited online courses, a number of distance learning hub sites have been developed which offer advice on how to avoid falling victim to diploma mills and fly-by-night "institutions" offering cheap degrees. The advice includes treating as suspicious any institutions with unfamiliar accreditation credentials, institutions with "international," "global" or "world" in their titles, and "sound alikes," which are schools that incorporate the names of legitimate institutions into their own names. Sites offering this service include Degree-net (www.degree.net), AboutEducation (www.about.com/education) and WorldwideLearn (www.worldwidelearn.com).

Students engaged in open and distance learning have traditionally been those who have been denied access to a full-time place. As lifelong learning becomes an imperative for active, full-time participants in the labour market, part-time adult distance learners will increasingly seek the convenience offered by technology-mediated learning to meet their professional and technical updating requirements. Such students are more likely to pay their own fees and, as consumers, will expect high-cost efficiency and effectiveness from their chosen providers. They will demand flexibility which extends beyond the curricula to include entry and exit points, access and accreditation of prior learning, study periods and modes of delivery. Prospective students will want to take the following steps to ensure that the course for which they register can meet their requirements:

- *Check the accreditation* and determine whether it passes muster. It appears that accrediting agencies exist which are prepared to rubber stamp colleges for a fee.
- *Grade the school* by checking out the courses, teachers and credit accumulation and transfer policies and procedures.
- *Tour the campus* by looking at the institution's Web site to see if it's up-to-date and well designed.
- *Use sample courses* and sit in on or a virtual class to determine whether the online format is what they want and to discover whether their computer meets a course's technical requirements.
- *Crunch the numbers* and read the fine print to check that it is what they expect from an online course and that they will not need to visit the campus to register, take exams or participate in classroom discussions.

Canada provides an example of an effort to protect the reputation and market share of higher education institutions in the global education marketplace. The Canadian government has funded the development of a consumers' guide, based upon extensive research into the literature relating to quality in technology-assisted distance learning. The project, which is being prepared for the Community Association for Community Education (CASE) and the Office of Learning Technologies (OLT) of Human Resources Development Canada (HRDC) by Dr. Kathryn Barker of FuturEd Consulting Education Futurists (FuturEd) aims to produce *Consumer-Based Quality Guidelines for Learning Technologies and Distance Education*. The guide is designed to be applied to education and training products (entire programmes and individual courses) at any level which are delivered by "technology-assisted distance learning," which is defined in the guidelines as "where the learner is in one location and the provider of the learning is in another and technology is used to make the link." In this context, the quality of the education and training products and services is defined in terms of what makes them effective and efficient.

Underpinning the guidelines is the belief that all learning products are a combination or system of inputs and resources, processes and practices, and outputs and outcomes. While all are important, "from the consumer's point of view, the outcomes are the most important, then processes and practices and finally inputs and resources that have gone into the design, production and delivery of the learning product/service."

The guidelines list the desirable features of a high-quality course or programme and are structured to reflect the hierarchy of concerns described above, starting with quality outcomes:

- Acquired content skills and knowledge should be:
  - Relevant.
  - Transferable.
  - Specific for the purpose (e.g. work or higher learning).
  - Blend traditional education and applied technology skills.
- Necessary learning skills are acquired for:
  - Course/programme completion and success.

  - Lifelong learning.
  - Self-directed learning management.
- Completion takes the form of credit or credentials that are:
  - Recognised by professional accreditation bodies and employers.
  - Recognised by other educational institutions.
  - Of the same value whether acquired through on-site or distance learning.
  - Transferable within programmes and institutions, locally, nationally and internationally.
- Return on investment of the learner's time, finances and energy meets expectations for:
  - Accessibility as needed and when needed.
  - Objective benefits and utility.
  - Effectiveness: subjective achievement of personal goals.
  - Efficiency: best use of resources.
  - Customer satisfaction with all course/programme elements.

The draft guidelines are available at www.futured.com.

To achieve the output standards listed above, the provider must have in place systematic quality processes and practices for student management systems in the areas of pre-entry counselling, admissions, registration and orientation of students, assessment and recognition of prior learning, and the accurate and secure management of student records. They should allow for learner involvement in decision-making and provide assistance for students with the technologies being used.

In the domain of learning management, the guidelines define the attributes of good teaching processes, good assessment practices, appropriate use of technologies and communications facilities and include the need for effective human resource management practices and an inclusive programme management system.

While the, first two sections of the guidelines aim to provide the student with sufficient performance indicators to enable him or her to evaluate the quality of the learning experience, the final section on quality input and resources provides a useful checklist for the policy-makers and providers of technology-assisted learning on the essential components of a quality course or programme:

- Clearly defined and achievable learning objectives.
- Relevant, scholarly and up-to date-curriculum content.
- Well-designed teaching and learning materials.
- Well-supported total learning package.
- Appropriate use of learning technologies.
- Sound technical design.
- Appropriate and necessary personnel support.
- Provision of access to additional learning resources.
- Planned resource provision.
- Outline review and evaluation cycle.

The FuturEd project includes in its objectives that the guidelines should reflect Canadian values, and its authors believe that if they are adopted by CASE and others in the Canadian technology-assisted distance learning community, the international market will appreciate Canadian quality values and have greater confidence in choosing Canadian courses and programmes offered online.

National governments in many of the advanced industrial economies have not been slow to embrace e-learning, recognising the potential presented by the global market for education to secure new revenue to offset high infrastructure and development costs and at the same time to further their ambitions to trade in other economic sectors. The advantages presented to learners in developing countries by the opportunity to access scarce, top-quality expertise anywhere in the world and to gain access to curricula that embrace a broader spectrum of knowledge than any one institution might accomplish, (Mason, 1998) must be offset by the danger of the emergence of a new cultural imperialism. The globalisation of content facilitated by the new communications technologies leads to a potential loss of cultural diversity and richness. In the domain of quality assurance, global access makes the application of standards and performance measures even more problematic. If standards are relative to the context, to the needs of the students and to their approach to learning, they will be disparate. If, as Tait (1997) asserts "no quality assurance system can be transplanted from one institution to another across organisational, social and cultural boundaries," how can local cultures, institutions and educational approaches retain their voice in a globalised world? The Canadian approach of researching global best practice and deriving national benchmark standards in key domains which can be applied both to local courses and to those offered by remote providers may offer a useful model which could be applied by policy-makers in other jurisdictions.

The Role of Accrediting Agencies

National quality assurance agencies have also published guidelines to meet the needs of their constituent institutions which are engaged in the delivery of open and distance learning. Examples include those produced by the Quality Assurance Agency of the U.K. in 1999 (www.qaa.ac.uk/public/dlg/append1.htm), which are based upon generic guidelines on quality assurance procedures originally developed for programmes delivered face to face, published in 1996, and the NZAAU's guide to "External Quality Assurance for the Virtual Institution" (Butterfield et al., 1999) referred to earlier. In Australia, where open and distance learning at university level is provided on a very wide scale through dual-mode institutions, and where the development of technology-mediated flexible learning resulting from the convergence between distance and face-to-face modes of delivery is well advanced, all institutions and programmes are audited according to a single set of benchmark standards irrespective of the mode of delivery (McKinnon et al., 1999). The approach of these agencies is influenced primarily by their mandate to assure the accountability of institutions in their sector for the expenditure of public funds and to maintain the credibility system by ensuring comparability of standards at the national and international level.

In the U.S., there is no national academic audit agency, and accreditation is a voluntary activity undertaken usually at the regional level among groups of institutions. In the global virtual education market, students continue to seek assurance that the programme they are studying is accredited by a reliable agency or that it bears the insignia of an institution or group of institutions, whose names are synonymous with excellence. The development of consortium arrangements for the delivery of online courses and programmes is mirrored by greater collaboration in policy development across accrediting regions and states. For example, the *Guide to Best Practice for Electronically Offered Degree and Certificate Programs* has been developed by the Western Cooperative for Educational Telecommunications, an arm of the Western Interstate Commission for Higher Education (WICHE) spanning 15 western states in the U.S. (www.wiche.edu/telecom/accrediting - best practices.pdf). This project takes as its starting point the fact that well-established essentials of institutional quality found in regional accreditation standards are applicable to the emergent forms of learning. Taken together, they reflect the values which the regional commissions foster among their affiliated colleges and universities:

- That education is best experienced within a community of learning where competent professionals are actively and co-operatively involved with creating, providing and improving the instructional programme.
- That learning is dynamic and interactive, regardless of the setting in which it occurs.
- That instructional programmes leading to degrees having integrity are organised around substantive and coherent curricula which define expected learning outcomes.
- That institutions accept the obligation to address student needs related to, and to provide the resources necessary for, their academic success.
- That institutions are responsible for the education provided in their name.
- That institutions undertake the assessment and improvement of their quality, giving particular emphasis to student learning.
- That institutions voluntarily subject themselves to peer review.

The resulting statements of best practice relate to five key areas of institutional activity relevant to technology-mediated distance education:

- Institutional context and commitment.
- Curriculum and instruction.
- Faculty support.
- Student support.
- Evaluation and assessment.

They offer a comprehensive guide for institutions contemplating the move into technology-mediated learning to the range of quality issues involved under these five headings. Yet again, the underpinning message to providers is clearly expressed: "Methods change but standards of quality endure. The important issues are not technical but curriculum driven and pedagogical. The big decisions are made by qualified faculty and focus on learning outcomes for an increasingly diverse student population" (WICHE, 2001).

The set of quality benchmarks for Internet-based distance learning published by the U.S. Institute for Higher Education Policy (IHEP) in April 2000 under the title "Quality on the Line" (www.ihep.com/quality.pdf) is based upon a study which identifies first-hand practical strategies to achieve quality learning being used in U.S. colleges which are acknowledged to be leaders in online distance education. As the press release which accompanied the launch of the study stated: "Many (of the benchmarks) are common sense, but the study validates their importance." The key areas affecting the quality of technology-mediated learning are common to all of the published benchmarks and guidelines and relate to:

- *Institutional support:* reliable secure technology; established systems for development and delivery of distance education.
- *Course development:* learning outcomes driven; regular review and updating; "designed in" learning activities (analysis, synthesis, evaluation.
- *Teaching/learning:* required and facilitated student/faculty interaction; constructive and timely feedback; instruction in effective research methodology.
- *Course structure:* pre-registration consultation; clear information on course objectives and learning outcomes; access to library resources; clear expectations on assignments and timelines.
- *Student support:* full information on requirements and support services; hands-on

training; access to technical assistance; transparent advisory and complaints structure.

- *Faculty support:* technical assistance; initial training and assessment in online instruction; ongoing support and mentoring; written resources.
- *Evaluation and assessment:* evaluation of educational effectiveness and teaching/learning process by multiple methods using specific standards; use of quantitative data to evaluate effectiveness; regular review of learning outcomes to ensure clarity, utility and appropriateness.

Other External Influences: Marketing Excellence

At the same time as external accreditation agencies and educational policy-makers are seeking to realign their quality criteria to meet the needs of institutions and students for appropriate benchmark standards in technology-assisted learning, the role of the media is driving an increased emphasis on internal quality review and the publication of performance indicators. As education (particularly higher education and professional development programmes) becomes more competitive, there is an increased consumer and stakeholder (including shareholder) demand for market information. Publications already exist to meet this demand for rankings in relation to face-to-face institutions. The annual ranking of U.S. colleges, universities and graduate/professional programmes published by *U.S. News and World Report* (see www.usnews.com/usnews/edu/eduhome.htm) is immensely influential. *Maclean's* magazine fulfils a similar role in Canada (see www.adm.uwaterloo.ca/infoipa/macleans.html and edmonton.globaltv.com/edm/news/stories/news-20001113-100346.html).

Despite the efforts of the U.K. QAA to prevent the findings of their assessment exercises being translated into rank order listings, U.K. institutions do find themselves ranked in the educational press by research excellence, teaching excellence and even by the salary of their vice-chancellor. Australian universities compete for the title of University of the Year, a media award which represents a much-prized addition to the letterhead of the more aggressively entrepreneurial competitors in the international and global education market. The home page of the University of Southern Queensland proclaims that institution to be joint winner of the *Good Universities Guide 2000–2001* University of the Year award for developing the e-university (see www.usq.edu.au).

External awards and media rankings alone cannot satisfy consumer needs for information on the quality of the education offered by virtual providers. Higher education institutions competing in the worldwide virtual education market may find themselves having to develop and disseminate information on the quality of their services on a continuous basis and to make it available to potential "clients" in readily accessible forms. In this regard, student and employer satisfaction surveys are already rapidly becoming key evaluation mechanisms which demonstrate responsiveness to market. The recently published (April 2001) results of the study by researchers from the University of Western Ontario's Richard Ivey School of Business and Athabasca University's Centre for Innovative Management comparing student-to-student classroom and online learning in M.B.A. programmes at the two institutions offers an interesting example of this phenomenon (www.athabascau.ca/mba). Technology-assisted delivery provides new opportunities to access data for the feedback-evaluation-quality improvement loop, which is an essential element of an effective quality assurance system.

Policy-makers opting for technology-mediated learning solutions must factor in the cost of designing quality management systems which use the data collected as part of a constant quality improvement process.

In addition to formal evaluation tools administered by the individual institutions providing technology-assisted distance learning, a number of the sites which act as brokers of online courses and programmes provide an opportunity for learners to review the offering and post it for consideration by prospective users. An example of this facility can be found at www.mindedge.com.

While this public scrutiny contributes significantly to the transparency of internal quality assurance mechanisms, and while learner feedback is an essential component of a fully developed quality assurance system for any institution, these measures are not of themselves a sufficient guarantor of quality in a global market in which technology-mediated education is growing exponentially. As Laurillard (1993) states: "Quality is best established through organisational infrastructure and collaboration. It is inefficient to promote quality via competition. Competition allows only non-referenced testing of 'products' not criterion referenced testing which is more rigorous and more suitable for the academic context." Thrall (1999) confirms the vulnerability of virtual universities to a loss of consumer confidence caused by their inability to provide evidence that they can withstand scrutiny by the traditional measures of academic quality. "Any qualms about quality among potential students could spell disaster for the virtual university that fails to aggressively address the issue. Even for those virtual universities that do not have their own faculty, but instead broker courses and degrees created and taught by other institutions, questions about technical and pedagogical standards loom large."

The Internalisation of Quality Assurance: Quality Education Work

If they are to achieve the prescribed benchmark standards of the relevant accrediting agencies and meet the demand for transparency in educational processes described above, virtual institutions must be actively engaged in what Massy (2001) describes as educational quality work (EQW) in the context of technology-mediated learning. Like much work in quality assurance in education, EQW has its roots in the ideas of Deming, Baldridge (see the 2000 performance criteria at www.quality.nist.gov/bcpg.pdf.htm) and ISO 9000, but is grounded in the context of academic operations. Massy postulates that the framework for quality management based upon EQW should empower and stimulate faculty to continuously improve teaching and learning. The five key domains of EQW are familiar from the current literature:

- The determination of learning outcomes.
- The design of curricula to meet the learning outcomes.
- The design of teaching and learning processes.
- The design and use of student assessment measures.
- The implementation of quality assurance.

In this methodology, institutions and departments exemplifying best practice should be able to demonstrate that they:

- Define educational quality in terms of learning outcomes.
- Focus on the process of teaching and learning to strive for coherence in curricula and educational processes.
- Work collaboratively to achieve mutual involvement and support.

- Base decisions on facts wherever possible (evaluation).
- Minimise controllable quality variation.
- Make continuous improvement a top priority.

The key respects in which appropriate quality assurance systems for technology-assisted learning differ from those designed for conventional face-to-face delivery are in their concern for the appropriate choice and effective management of the technology to meet the expectations of all of the stakeholders and in the emphasis they place on the need for faculty and student training and support systems to enable them to operate effectively in the new learning environment.

Can Virtual Education Deliver on Its Quality Promises?

In the U.S. in 1997–98 federal survey of distance education estimated that 1.4 million students were enrolled in for-credit college level courses. New estimates are that about 75% of established colleges and universities have some online presence including the requirement that students in conventional face-to-face institutions take at least one online course each semester, which means that virtual education is a reality for over one million students. For example, at Fairleigh Dickinson University, to ensure that graduates are comfortable researching, exploring and relating in cyberspace, all students (effective with the freshman class entering in September 2001) are required to take a distance learning course each academic year (see www.fdu.edu/academic/webcampus.html).

According to IDC, a technology research firm, approximately 85% of established colleges and universities will rely on some form of distance education by 2002. If one takes into account the accredited for-profit universities, the institutions formed by alliances of institutions and the prestigious face-to-face institutions proposing to provide global access to some of their courses by e-learning through links with educational technology companies, one might be forgiven for assuming that virtual education provides worldwide access to educational opportunities in quantity and quality unparalleled in the history of open and distance learning. (For an example of how Cambridge University has linked up with educational technology companies, see the article "The Cambridge E-MBA — A Market First," at www.geteducated.com/vubd/vubdjan2001.pdf.)

Technology-assisted learning holds out the promise of enhancing distance education by:

- Enabling the active engagement of the learner in the construction of knowledge.
- Making available real-world problems and situations.
- Providing representations in multiple modalities.
- Drilling students in basic concepts to reach mastery.
- Facilitating collaborative activity among a diverse student group.
- Requiring students to learn the tools of scholarship.
- Simulating laboratory work.
- Providing continuous opportunities for self-assessment.

Nevertheless, low completion rates in virtual courses and programmes continue to reflect students' frustrations with those features of the virtual learning environment which do not match up to the on-campus experience. Despite the potential of technology to deliver convenient "any time any place" education, the primary demotivating factors for the virtual e-learner continue to echo the long-running complaints of the distance learner, which stem from a sense of isolation from a learning community:

- Lack of access to student support.
- Unavailability of financial aid.
- Lack of timely feedback.
- Technical problems with delivery techniques.

In *The Business of Borderless Education*, (Cunningham et al., 2000) a series of "hot spots" for consideration by agencies seeking to accredit virtual courses and programmes is listed. These hot spots indicate those areas where the current practice of virtual providers frequently does not match the standards set for other accredited distance learning provision and affects stakeholder confidence:

- Standard of online information and library resources.
- Verification of student identity in a virtual environment, including for the purpose of assessment.
- The use of part-time contract as opposed to full-time tenured academic staff.
- Subcontracting of administrative and ICT functions to separate commercial companies.
- Corporate management prevailing over academic governance.
- No or little research undertaken by faculty.
- Decoupling of research and teaching/course development.
- Limited range of programmes (best-sellers).
- Trans-border coverage.
- Discrepancies between measures of attendance in online and face-to-face modes.

The first of these concerns relating to the quality of Internet information sources has been addressed by a number of university libraries. This has led to the development of guidelines to evaluate such sources, which commonly relate to the scope, content, accuracy, authority, currency, uniqueness and quality of the writing in the quoted references as well as to the links to other resources that they provide (see http://info.lib.uh.edu/pr/v8/n3/smit8n3.html).

The recently announced (April 2001) Open Course Ware (OCW) initiative by Massachusetts Institute of Technology (MIT) in which it proposes to put nearly all of its course material online over the next 10 years and which seeks to "begin to realise the Internet's potential as a Great Library of Alexandria for the 21st century world" should provide a boost to Web-based distance learning by adding to the total number of resources available on the Web (see web.mit.edu/newsoffice/nr/2001/ocw.html).

Barriers to Quality

In all of the hyperbole surrounding the marketing of e-learning as the golden key with which worldwide learning opportunities will be unlocked, it is easy to lose sight of a number of barriers which continue to affect the achievement of quality goals in technology-assisted learning. The first and most significant of these relates to inequality of access to the technology itself: the so-called digital divide. Even in the U.S. where the penetration of the Internet is reaching 43% (135.7 million users) and where online education is most prevalent, most Americans do not have a computer at home hooked up to the Internet, and those that do are using a 28.8K modem which effectively limits the ability of faculty and instructional designers to develop truly effective and appealing online courses (Thrall, 1999). Moreover, if one takes into account the fact that in China, penetration is only 2% and in India 3% and even less in other jurisdictions, (Dhanarajan, 2001), those without access to the hardware, connections and skills to use the ICTs will be effectively disenfranchised, unless providers recognise that the provision of access to lifelong learning opportunities tailored to meet the learners' needs is part of their mission as educators. Dhanarajan raises the spectre of these already disenfranchised groups of the "digitally homeless" being ignored in "the relentless pursuit of market share, recognition and profit."

The accusation that a global, technology-mediated education is "inherently immoral, consumerist, and sub-standard" (Mason, 1998) is one element of the vociferous opposition to virtual learning, expressed by traditional universities (as indeed it was for open and distance learning some 30 years ago). This view echoes justifiable concerns from the distance education community that best practice in technology-mediated learning will be derailed because of a chronic lack of funds in the public sector and an overriding concern for the financial bottom-line in the for-profit sector.

The rapid development of ICTs and the resulting emergence of a common technology-mediated flexible learning paradigm in both face-to-face and distance teaching has necessitated a change in the role of faculty "from being mainly a content expert, to a combination of content expert, learning process design expert and process implementation manager" (Massy, 1997), which, at the very least demands that they undertake a serious reappraisal of their function, competencies and mode of interacting with students. It is evident that e-learning will require the acquisition of new technological skills and knowledge, and that it has the potential to undermine faculty status prerogatives, may lead to the loss of faculty jobs, threaten ownership of intellectual property and decrease personal contact with students, while at the same time requiring them to provide 24-hour access by e-mail and to give prompt and clear responses to all queries.

Klass (2000) acknowledges that the resistance from academics is to some extent motivated by self-interest but indicates that "many are troubled by the prospect that a combination of market forces and Internet technology will produce 'digital diploma mills,' undermine the fundamental faculty prerogative of tenure [and] accelerate the growth of an instructional underclass" while at the same time, necessitating greater administrative control of academic activity; "the potential for administrative scrutiny, supervision, regimentation, discipline and even censorship increase dramatically."

Resistance to change is not a new phenomenon in universities. F.D. Roosevelt is quoted as remarking that "it is easier to move a cemetery than change a university curriculum." If the defining characteristics of a traditional university are that it provides "a rich educational environment, informed by research, supported by library resources and enhanced by campus togetherness" (Mason, 1998), the well-managed virtual university can provide all of these through technological means. What is more, it can offer its students hitherto undreamed of convenience, flexibility, relevance and opportunities for interaction with faculty and fellow students from around the world.

National governments, in the developed world at least, have recognised both the potential of e-learning for meeting the needs of their citizens, and the danger inherent in being left behind. The (Canadian) Advisory Committee on OnLine Learning, in its March 2001 report to the government, summarises its position thus:

> In a global society based on expanding knowledge, Canada's health as a civil society and its economic competitiveness, as well as the success of individual Canadians, will hinge on having the best possible education and access to lifelong learning opportunities. Around the world, online learning...has emerged as a powerful and transformative means to meet these learning needs, as well as to extend and enrich traditional modes of instruction at the post-secondary level (Advisory Committee on Online Learning, 2001).

The report points out that if Canada does nothing, online learning will still come to post-secondary education in Canada, but it will increasingly be provided to Canadian learners by off-shore institutions and corporations that will be responsive only to global market forces and their own domestic exigencies. The requirements of Canadian learners, communities and employers will not be of much concern in most cases.

In the policy discussion paper which marked the first steps towards the establishment of a National Virtual University for Finland (Karran and Pohjohnen, 2000) the researchers were given the task of designing a structure which could maximise the benefits of the use of new technologies to higher education in the most cost-efficient way. After comparing the results of the California Virtual University and the Western Governors University, the team concluded that "The opportunities presented by a NVU will be best exploited if it covers a full range of university features including [not only] teaching, [but also] research, technology transfer, careers advice, and if it links to local/regional learning communities."

In December 2000, the Web-based Education Commission to the President and Congress of the United States submitted its report entitled "The Power of the Internet for Learning: moving from promise to practice." It identified the promise of the Internet:

- To centre learning around the student instead of the classroom.
- To focus on the strengths and needs of individual learners.
- To make lifelong learning a practical reality.

It also identified the existing barriers to realising the potential of the technology for enhancing learning and made a series of key recommendations on how to remove them. The solutions identified in the report relate to the key meta-components of quality in virtual education discussed above:

- Equitable access to appropriate technology.
- Sustained staff development and training.
- Systematic curriculum design and development embodying appropriate cultural values and based on an understanding of students' learning needs in the local context.
- Well-supported delivery based on an understanding of learning styles.
- Well-integrated evaluation and feedback mechanisms.
- Long-term resource planning to ensure sustainability.

It is vital that any policy-maker contemplating introducing technology-mediated distance education should be ready to make a commitment to securing the technical, legal, financial, human and pedagogical infrastructure requirements described in that report. It is therefore appropriate to conclude this review of quality assurance in virtual education with a must-do list for policy-makers and administrators contemplating making the leap into e-learning:

- Provide access to the technologies at affordable costs.
- Provide continuous training and support for educators and administrators at all levels in the effective use of technology for educational purposes.
- Establish or have ready access to a research, development and innovation programme to investigate how people learn in the Internet age and what kind of organisational structures can best support that learning.
- Develop or acquire high-quality online educational content that conforms to the highest standards of educational excellence and meets the needs of its learners.
- Revise the legal and regulatory framework to enable it to support a flexible, learner-centred global educational paradigm.
- Protect learner privacy.
- Sustain funding to support the new developments.

The last word must go to Sir John Daniel, Vice-Chancellor of the UKOU, who in a speech at the OUHK in December 2000 reminded his audience: "Finally and very importantly, we must remember that online learning is a means to an end. For us the purpose is to be an open university, defining ourselves in terms of what we do for people, not an e-university defining ourselves in terms of the technologies we use."

Educational providers who are considering entering the field now have extensive literature and multiple examples of well-designed codes of practice to guide them. Technology-mediated learning has the potential to enable more learners to achieve quality learning outcomes. In order to meet the needs and aspirations of the learners, appropriate, culturally sensitive quality assurance mechanisms must be designed, keeping in mind all of the processes contributing to the educational programme. Wherever possible, the capacity of the delivery technologies for data collection and analysis should be harnessed for the purpose and the cost of quality assurance must be factored into the calculation of total expenditure required to launch a successful initiative.

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Additional Web Resources

EDUCATIONAL TECHNOLOGY COMPANIES

AboutEducation	www.about.com/education
degree.net	www.degree.net
World Wide Learn	www.worldwidelearn.com
Mind Edge	www.mindedge.com

MEDIA

U.S. News and World Report	www.usnews.com/usnews/edu/eduhome.htm

UNIVERSITIES

Fairleigh Dickinson	www.fdu.edu/academic/webcampus.html
Southern Queensland	www.usq.edu.au
Houston	www.uh.edu

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8 Issues and Choices

DR. GLEN FARRELL

One of the conclusions of the 1999 COL report on the status of virtual education development was that it was more rhetorical than real. Now, two years later, it appears to be both more rhetorical *and* more real. And the gap is closing between the reality and the rhetoric! However that depends on where you live. If you reside in a developing country, for example, the vision you have for virtual education may not be much different from a colleague's in North America or Australia, but the possibility of being able to implement it is considerably more limited. The reality is that the developing countries of the world are largely being bypassed by the surging developments in virtual education. The Study Team hopes that this analysis of macro developments in virtual education will provide the basis for strategies that will help to address this situation.

The Concept of Virtual Education

The need to improve access to educational opportunities, at all levels, led to the innovation of correspondence courses in the latter part of the 19th century. Over time this delivery model incorporated the use of study centres and telephone networks for tutorial purposes and became known as "distance education" to connote education at off-campus locations. As real-time technologies were applied, such as radio, television and videoconferencing, a variety of additional labels emerged such as "open learning," "flexible learning," tele-learning" and "distributed learning."

As online delivery models have become possible with their capacity to enable asynchronous interactivity, the terms "virtual education," "online learning," and "e-learning" have emerged. They are being used, often interchangeably, with all of the earlier labels to describe almost any educational activity that makes even minimal use of information and communication technology (ICT).

This is confusing to those who are unfamiliar with the history of "distance education," and it is also dysfunctional in terms of the development of an inclusive view of educational systems and the use of ICT. It serves to maintain a conceptual dichotomy between the traditional classroom-based delivery model and all others when, in fact, the most significant effect of the use of these technologies is to bring about a convergence between traditional education models and what is most frequently called "distance education."

A much more integrated vision of learning venues and opportunities is needed in a world that requires educational systems to respond to education needs throughout life. Such a vision needs to accommodate the reality that learning occurs in a variety of venues — the classroom, the home, community learning centres and the work place. It also needs to portray the use of technology in terms of how it can facilitate the provision of educational opportunities, wherever they are occurring, by making them more accessible and of higher quality, and by enhancing the effectiveness and efficiency of their methods of delivery.

However, this integrated vision includes several different learning modes, and the terms used to describe these modes in this report need to be made clear:

- The term "flexible learning" is used to describe learning opportunities than can be accessed "any place and any time." The term relates more to the scheduling of activities rather to any particular delivery mode. For example, a flexible learning environment can be provided in any of the venues described above.
- "Distance education," on the other hand, connotes a physical separation between the learner and the teacher with a variety of mediating processes used to convey content, provide tutoring and conduct assessment of knowledge and attitudes. "Distance education," therefore, should not be applied to on-campus learning venues.
- "Open learning" refers to the policies of the educational system in which the learning activity is occurring. Policies that permit open entry to learning, liberal transfer of credits and recognition of prior learning would be indicators of an open learning system. Such policies are often not part of a distance education system, yet the two labels are often used together and interchangeably. This can be very misleading.
- The labels "virtual education," "online learning" and "e-learning" have emerged to describe the application of ICT to enhance distance education, implement open learning policies, make learning activities more flexible and enable these learning activities to be distributed among many learning venues. We have chosen to use the term "virtual education" because "online learning" tends to connote a greater emphasis on the use of computers and the Web and "e-learning" tends to be used more often in the context of business operations and ICT-enabled staff training. In other words, we are regarding "online learning" and "e-learning" as specific subsets of the larger concept of virtual education. Our reason for doing this is that we believe that the macro developments will enable more diversity among educational models rather than ones that are more exclusively "online."

This clarification of terminology is not trivial — for several reasons. First of all, the issues involved in the evolution of virtual education models need to be debated in a context in which all parties have a clear understanding of what different labels mean and imply. The second reason is that, as time advances, ICT will be increasingly used to enhance all forms of learning, at all educational levels, making it even more important that the nature of the ICT application not be misconstrued because of the label used.

An Emerging Vision

Taken together, the macro developments described in this report suggest the possibility that educational systems will be marked by some or all of the following characteristics:

- Future models of virtual education will be more "Web-centric" in that they will be ICT enabled and will make increasing use of the Web. But these systems will not be exclusively online or used only to serve learners "at a distance." They will be as much concerned with enhancing classroom-based learning, at all levels of education, as they are with learning that occurs in "off-campus" venues.

- Systems will be more "learner centred" or "customer-aware," in the sense that they will:
  - Enable learners to interact with content, teachers, administrative and service resources in ways that fit their circumstances.
  - Provide learners and teachers with access to online resources such as text, video and audio learning resources, lesson plans and assessment strategies that are qualitatively equivalent or superior to those available in the traditional learning environment. This will enable models of "resource-based learning" to become more prevalent.
  - Give learners increased choice in the mode of delivery of their learning experience. This will enable them to tailor the learning experience to their needs.
- Learners will be able to access educational programmes from anywhere, thus saving substantially on relocation costs.
- Learners can have existing skills and knowledge assessed and credited towards future programme credentials and, if required competency standards are demonstrated, they will be able to obtain credentials from a variety of accredited institutions that have developed specialised assessment and credit-banking services.
- Indigenous expertise and knowledge can be incorporated to add value to learning resources acquired from elsewhere.
- Learners will be able to choose to meet their educational needs from a "quality-assured" list of providing institutions.
- Greater "dis-intermediation" of the teaching/learning process will be possible in the sense that:
  - Individual learners will be able to go directly to learning object databases and interact with the content as they wish.
  - Peer-to-peer interactions will enable learners to establish their own learning groups focused on content they have created.
- Programme planners and instructional designers can aggregate and sequence content according to the needs of particular groups of learners by selecting learning objects from large content databases and selecting the appropriate mode of delivery.

The foregoing is an illustrative list of implications that the macro developments discussed in this report have for educational systems of the future. Others will emerge as these macro developments evolve. Not all of them will prove to be desirable or appropriate in all circumstances. Indeed, members of the Study Team engaged in some vigorous debate during their time together in the three-day workshop. At the core of the debate was the argument that these macro developments will enable learners to have more choice in terms of being able to tailor their learning to suit their needs. The counter argument was that these developments may make the achievement of some learning outcomes more difficult, such as the development of shared values and a shared sense of "community." A subset of this argument was that these developments may reinforce a vision of education as purely a business arrangement between customers and suppliers.

The discussions continued following the workshop via the project listserv. They were stimulated by references to a collection of essays entitled *Peer-to-Peer: Harnessing the Power of Disruptive Technologies,* (Oram et al., 2001), an article that argues that extensible markup language (XML) is going to revolutionise the Internet (Bosak and Bray, 1999), and another that discusses the implications of peer-to-peer interactions in online learning (Pinaroc, 2001).

In the end, team members concurred that the debate should not be cast in an "either/or" context. While the above risks are real, the reality is that the institution still maintains a key authority, and that is the credential. The institution can still set the requirements for obtaining any of its credentials, and those requirements can reflect the shared values of the faculty of the institution. Those requirements might vary from institution to institution to reflect the varying values on which the institutions stand. Furthermore, as new organisations introduce new credentials, those credentials will reflect the values of the new organisations. Those values may be quite different from those that have historically obtained in institutions of higher education.

Driving and Constraining Forces

The forces acting on the evolution of virtual education, while essentially the same as those identified in the 1999 COL report, are now operating in an environment that has changed and is much more dynamic. Thus, their relative importance in any given context is even more variable than it was at the time of the earlier report.

DRIVING FORCES

- The perception that the application of ICT to the delivery of educational opportunities will reduce costs and lead to an increase in market share.
- The need to respond to criticisms about the quality of the traditional "distance education" learning experience by using ICT in ways that enable more access to learning resources and enhance interactivity and collaboration between and among learners and teachers.
- The escalating demand for access to lifelong learning opportunities, particularly those related to upgrading and staff training, are causing both institutions and corporations to adopt ICT applications to reduce the cost of travel.
- The ability to "unbundle" or "disaggregate" functions that have traditionally been solely provided by a single institution through its administrative systems and its individual classroom-based teachers.
- The adoption of ICT by educational organisations allows them to proclaim their involvement in virtual education. Such involvement allows them to be seen to be "with it" and to overcome their fear that if they don't find a way to be involved in some virtual education venture, they may face a doubtful future.
- The increasing capacity of ICT to facilitate educational processes makes the application more appealing to educators, and the reducing costs of both hardware and bandwidth make adoption more affordable.

CONSTRAINING FORCES

- The lack of access to ICT appliances and connectivity, what has come to be called the "digital divide," remains as a severe constraint, particularly in developing countries.
- The front-end costs associated with the development of ICT infrastructure and ICT-based instructional materials are difficult for organisations to finance without a substantial reallocation of current resources. Within most institutions that is a difficult decision to get support for!
- Teachers and faculty remain concerned about the quality of education that is delivered through the use of virtual models. They are also finding that it adds to their workload without commensurate rewards or clarity about intellectual property issues.

- Experience to date with virtual education is proving the necessity for extensive training and support for both faculty as well as learners. This too is costly.
- Learner support systems are still not providing the level of service that is available to the "on-campus" learner.
- The lack of agreed-upon standards such as those described by Porter (Chapter 4) for initiatives such as the development of learning objects databases restricts the ability of institutions to collaborate in terms of sharing costs and resources. The lack of shared standards is manifest in other areas as well. For example, the lack of measurable, shared standards for academic quality restricts the portability of skills and knowledge from one institution to another.
- There is mounting evidence that the size and profitability of the international market for online learning and e-education is more limited, and much more competitive, than originally perceived.

General Observations

The discussions of the Study Team generated a great deal of debate about the nature and likely impacts of the macro developments and the issues they present for learners, institutions, teachers, leaders and policy-makers. The following observations are a synthesis of the discussions.

Firstly, the role of virtual education in society is almost exclusively thought of in the context of "distance education." This tends to limit thinking about how ICT might enhance and enable education in a more general way because it excludes the educational activities that occur in schools and on campuses that typically involves some face-to-face teaching. As several of the authors remind us, decisions about applications of technology are better made when the total context of the learners is kept in mind — their goals, their learning venue, their learning skills and experience, their learning styles and their level of motivation.

The virtual education agenda has changed as well. It is no longer solely, or even primarily, about technology. The focus now is about whether or not it is appropriate to the institutional vision and values, what operational issues it will create for the organisation and how the costs can be managed. This changing agenda is partly due to the fact that there is generally more experience with results of ICT use in education. However, it also reflects the fact that the debate has become of more concern to the mainstream decision-making process within institutions, rather than being isolated to a specific, and more peripheral, part of the organisation such the "distance education" unit.

The reasons for the increasing interest in virtual education distill down to the achievement of one or more of three basic objectives. They are:

- To increase access to learning opportunities by enhancing the flexibility of delivery modes or by eliminating geographic barriers to participation.
- To enhance the quality of the learning experience in terms of content or pedagogy.
- To enhance institutional efficiency by reducing costs, increasing productivity or increasing market share.

The debate about how, or whether, institutions should go about achieving these goals is what constitutes the new agenda.

The macro developments and the forces acting on them are highly interactive in terms of cause and effect. For example, the increased attention being given to quality monitoring and learner support services reflects the realisation that these concerns must be addressed if virtual education models are to continue to grow and be effective. The growth of learning centres is occurring because of the lack of access to ICT appliances and connectivity. The development of new organisation models is due not only to the fact that new technologies enable functions to be disaggregated, but also to the need to bypass traditional models of cumbersome management as well as the need to share costs and risks among several partners. The emergence of learning objects databases is enabled by the evolving technologies, but it also creates new issues related to cost, quality, intellectual property ownership and the potential fragmentation of the learning process.

The macro developments discussed in the chapters of this report enable a comprehensive disaggregation of educational processes. For example:

- The development of learning centres in communities and the work place allows for more decentralisation of the venues where learning opportunities can be organised.
- The applications of ICT enable the unbundling of many functions that historically have been carried out within individual institutions. This enables new organisational arrangements to emerge which spread the responsibility for some educational processes across several organisations rather than one.
- The emerging ability to access large content databases consisting of learning objects will enable not only separation between content and the format of its delivery, but also the selection and sequencing of content to suit particular learner profiles.

As the ability to ensure the educational quality of the programmes and services of these new organisational models improves, we can expect the pace of this unbundling or disaggregation of institutional functions to increase.

However, there is nothing inherently good about the disaggregation of institutional functions. The fact that it can enable new forms of inter-institutional collaboration simply provides more choice for educational leaders. For example, they can select ICT applications solely on the basis of their ability to add value to the "on-campus" learning environment. Or, they can create a new virtual organisation, with functions distributed among several partners, with technologies selected to provide learning opportunities and support services to learners in a variety of learning venues spread over large geographical areas. In other words, decisions about the elements that should make up a virtual learning environment in the future will need, more than ever, to be based on the vision an organisation has for its mandate and for the learners it intends to serve.

The costs related to establishing a virtual learning initiative are already high. The development of learning objects databases and more online services will likely drive costs even higher. As a result, it is becoming more difficult for individual institutions to "go it alone." In this context, partnerships and joint venturing become more attractive as a means of sharing investment costs and in-kind resources.

The 1999 COL Report described several models of virtual education. One did not involve institutions, but rather peer-to-peer interactions in which individuals were posting content on the Web for use by any other interested persons. The Study Team stated that this development was becoming commonplace on the Web and, therefore, should be recognised as a growing resource for learners. As Porter has indicated, this phenomenon is growing and is of increasing importance in a resource-based learning environment (see Chapter 4).

It is clear from Dirr's comprehensive review of new organisational arrangements that these are occurring primarily in the developed world (see Chapter 6). Not much seems to be happening in developing countries by way of partnerships, consortia or private/public sector alliances. Institutions in developing countries seem more inclined to act separately. However, because of the costs and expertise required to develop virtual education systems, there may be significant advantages to using some of these new organisation models.

The respective roles of the public and private sectors in the development of virtual education are converging in an unprecedented way in the context of virtual education. There are several reasons for this:

- The private sector is becoming more involved in core educational functions such as the development and delivery of content, tuition and assessment, awarding of credentials and the provision of the ICT infrastructure through which virtual education is enabled.
- The globalisation of infrastructure makes it more difficult to manage communications policy at the level of the nation state.
- The increasing ability for institutions to unbundle functions and distribute them among several partners. The policy issue this raises is that of deciding what aspects of distance education can and should be under the purview of the public sector.

A variety of socio-political realities will determine the roles of the public and private sectors. However, what we see emerging is a perception that virtual education is part of the broader e-commerce revolution. This encourages the view that virtual education activities are synonymous with a business model in that they are expected to be self-sustaining, if not profit-making! But, more importantly, it implies that virtual education is still an add-on to mainstream public sector education models. As a result, virtual education is, by and large, not getting the attention it should be from policy-makers.

The view that virtual education is essentially a "business operation" may result in the adoption of more business-like management practices and lead to better management of public sector institutions. However, from a programme marketing perspective, it is also resulting in the phenomenon of "picking the low-hanging fruit." For example, the types of programmes most frequently developed for delivery by virtual education methods are the ones most likely to generate a profit, such as those related to business processes and technology. This tends to leave the non-cost recovery programmes to the public sector, without the ability to cross-subsidise them from profits resulting from the higher demand programmes. Another concern with the "business" view of virtual education, is that it may lead to processes that reflect business operations rather than those that enable the types of social interactions so important to the learning process.

It is clear that the prospect of significant revenue generation potential that is driving much of the excitement about virtual education is causing the environment to become increasingly competitive. Many of the initiatives underway are all after that same "low-hanging fruit"!

Whether or not the assumptions being made about the profitability of virtual education are valid remains to be seen. However, it is worth noting that the early successes are in the content areas of business and technology and mostly aimed at the staff training and development market.

The growth of virtual education is tending to erode the historic distinctions that have existed within education systems. Distinctions such as training and education, credit and non-credit, and formal and non-formal are much more difficult to sustain in an environment in which content is no longer linked to pre-defined programmes and courses or to any particular mode of delivery. These distinctions are being further eroded by the development of competency-based assessment models, the assessment and accreditation of prior learning and the development of credit banking organisations with the authority to award credentials.

Perhaps the most important observation arising from the analysis and discussion of these macro developments is the application that has begun to occur at the K–12 level. Virtual education applications have, up to this point, primarily been occurring at the post-secondary level and in the context of continuing professional education and corporate training. However, as several of the chapters in this report make clear, it is beginning to happen across all levels of educational endeavour.

Implementing the Vision: Essential Actions

Bates, in his chapter on emerging technologies (see Chapter 3), puts forward the concept of a "readiness threshold" for the introduction of virtual education. He argues that the following criteria need to be met in order for the initiative to be successful:

- The target group(s) of learners must be described, with learning needs clearly identified and a vision developed for meeting these needs through the use of virtual education.
- There must be access to electricity, even if it is only from small-scale sources.
- There must be access to connectivity.
- There must be a skilled labour pool in such areas as instructional design and technical support, or there must be available training opportunities to develop it.

Clearly, a decision to implement virtual education strategies is not a trivial one. In addition to the size of the financial investment, there are other hard choices that involve teacher/faculty roles, ownership of intellectual property, quality assurance, inter-institutional collaboration, potential for private/public sector partnerships and joint ventures, to name a few. The list of following actions, while not exhaustive, illustrate what the Study Team feels deserves particular attention in decisions about implementing virtual education:

- The above choices need to be addressed within the context of a systematic planning process that begins with a vision of "what could be," rooted in an analysis of learners' needs. This requires an analysis of the current reality to identify the gap between "what is" and the vision for what is desired. Strategies for closing the gap that are appropriate to education needs and are practically achievable in a given context can then be identified. This last point is critical. Plans and strategies imported from elsewhere are seldom applicable in a different milieu.
- The planning process must be comprehensive. All aspects of an education system need to be examined to determine if there are aspects of virtual education that can add value to current practices and processes. This will avoid the pervasive view that virtual education is synonymous with distance education and, therefore, of no relevance to classroom-based education. As is pointed out several times in this report, virtual education is a concept that is relevant across educational sectors and learning venues. It captures the reality of convergence between distance and classroom-based education.
- The foregoing point underlines the importance of paying attention to the terminology used in a planning process. The labels used conjure up pictures in the minds of stakeholders, and it is essential that all concerned be as clear as possible about what is being discussed. As we have already pointed out, distance education, virtual education and open learning are not the same thing.
- No vision for virtual education can be successfully implemented without an enabling infrastructure in place. Teachers and learners must have access to the necessary technical appliances, connectivity, software and appropriate learning venues. Institutions need a plan for what this infrastructure will look like, the timelines for its implementation and the fiscal plan for carrying it out. Governments need to commit to policies that reduce

Internet access costs as part of a general investment strategy for the development of virtual education. The Study Team supports the view expressed by Butcher that —

> if additional investments in using distance education methods are to make a meaningful and sustainable impact, they will have to be made as part of a broader process of shifting patterns of expenditure on education, with a view to ensuring that these changes contribute more broadly to changing patterns of behaviour within educational systems as a whole (Butcher, 2000).

- Just as expenditure patterns need to be reviewed, the policies and core business processes of institutions need to be reviewed and re-engineered to ensure that they enable and support the development of virtual education. For example:
  - The support requirements of learners in a virtual education model cannot be adequately provided for through policies and procedures designed for learners in a traditional classroom-based model. Virtual education learners will need help to develop skills such as managing and evaluating information, being more self directed in their learning behaviours and in using the learning technologies.
  - If teachers and faculty are to embrace the implementation of the vision, they will need training in the use of the learning technologies and be supported in adjusting to changes in their roles. They will also need to be supported by policies that motivate and reward their participation. For example, policies regarding promotion and ownership of intellectual property need to align with the vision.
  - The ability for learners to be able to access the courses and programmes being planned is an obvious need. Meeting it may require partnerships with other institutions in order to provide access points, inform potential learners of the availability and ensure that cost will not limit access.

  In other words, applying a technological veneer to practices and policies that were designed to serve a traditional educational environment, will not optimise the achievement of a new vision for virtual education.
- The importance of fully costing all of the actions contained in a plan to implement virtual education cannot be over stressed. A fiscal plan that reflects both direct and indirect costs, and how the resources will be provided, is essential to the development of a plan that will be sustainable.
- Content and technical standards need to be adopted that will optimise interoperability with other institutions and organisations in areas such as the creation of learning objects databases, information databases such as libraries, administrative systems and learner support strategies as well as the facilitation of interactions among learners and teachers.
- Decisions about potential alliances and partnerships need to be undertaken with a full understanding of the likely consequences. Collaboration with other institutions and organisations usually means giving up some autonomy in order to achieve benefits. This decision process will require that institutions give careful thought to the core functions that they must retain direct responsibility for, as opposed to those that could be provided more effectively and efficiently by partner organisations. As both Dirr (Chapter 6) and Hope (Chapter 7) point out, the issue of

quality assurance is an example of a core function that institutions cannot afford to take risks with.

- Strategies for implementing the changes outlined in plans for a move to implement virtual education need to be tailored to the situation:
    - If plans have been developed through a process that has garnered the support of the affected parties, implementation can likely proceed as quickly as resources allow. The strategies in this situation can be focused on the acquisition of the resources.
    - Another strategy is to attempt to fast track the implementation of virtual education. However, attempts to do this in education organisations are often met with resistance. In some cases this has been strong enough to nullify the vision entirely. Indeed, this reason, plus the cumbersome decision-making process in most educational organisations, are why many institutions choose to bypass the parent organisation and set up a separate organisation, often in partnership with others, with its own governance structure.
    - The more typical process for introducing virtual education is through a process of incremental change. This allows change to be undertaken in small "projects" that enable the institution to gain experience and to make adjustments as they proceed.
- Evaluation and research about the effects of virtual education on improving access, enhancing quality and increasing efficiency and revenue need to be an essential part of a plan for implementing virtual education strategies. The data collected will inform decision-makers and allow adjustments as the implementation proceeds. This process will ensure accountability to the stakeholders and, most importantly, it will enable the organisation to measure its performance against the objectives it has for implementing virtual education.

Myths, Opportunities and Risks

MYTHS

Decisions to introduce innovations in organisations are often influenced by myths, unquestioned assumptions and general hype. The Study Team believes it is vitally important for educational leaders to be aware of some of these myths as they pertain to virtual education:

- The development of virtual education is primarily a technical decision involving the delivery of courses. Not true! The changes required to all other aspects of an educational system dwarf the technology decisions and will be more costly to implement.
- Virtual education can be "added on" to the existing core business practices of an institution. Not true! There will be a "knock-on" effect from the introduction of virtual education that will affect all other administrative and academic practices.
- Virtual education is about providing learning opportunities and services to people who cannot attend schools and campuses. It is about that — and more! Decisions about the use of virtual education need to be taken from a holistic perspective that looks at the costs and benefits that learners and teachers will obtain whatever the learning venue.
- The adoption of virtual education will reduce costs. It might! But only if there is a clear plan that defines how that will occur.

For example, many organisations have effected major cost reductions in the area of staff training through the use of virtual education because it has reduced the travel budget. Without such a plan, it is likely that cost will increase!

- There is no future for an institution that chooses not to adopt virtual education. Wrong! It is difficult to imagine an institution that will not be able to improve on one or more of the goals of increasing access, enhancing quality or improving efficiency through ICT applications. However that doesn't necessitate abandoning serving students in a traditional campus-based setting.

OPPORTUNITIES

Just as there should be no assumptions that virtual education is appropriate for all jurisdictions and institutions, neither should there be an assumption that this phenomenon can be ignored. The opportunity for "adding value" to one or more of the goals of improving access, enhancing quality or improving efficiencies through the use of some aspect of virtual education is very real. These opportunities will only be enhanced by the macro developments described in this report.

- A much more "learner-centred" model of education will be possible than has ever been the case in the past. At the elementary level, teachers will be able to enrich curricula and to be more creative in their pedagogy. As learners move towards higher education, choices and options concerning both content and learning mode become wider and, more easily tailored to suit individual learning styles and circumstances.
- The potential to share costs, distribute risk, derive revenue and re-focus institutional mandates is increased remarkably through the new organisational models that are emerging. Collaboration through partnerships, consortia and joint venture arrangements offer solutions to problems of financing the adoption of virtual education, especially for many smaller institutions and, perhaps, for institutions in developing countries.
- The opportunities for collaboration on the development and delivery of programmes, particularly in developing countries, is likely to be found most easily in content areas such as professional upgrading, teacher training, small business development and management, science and technical programmes, elementary and secondary school curricula enhancement and literacy and basic education.

RISKS

From a global perspective, there are some "macro risks" that the Study Team believes are associated with the macro developments. For example, there is the potential to create even more educational disenfranchisement if the growth of virtual education continues in such an uneven manner between developed and developing countries. This risk is also present within nations. The "digital divide" has several faces that are present in all jurisdictions regardless of the stage of economic development. This underlines the need for policies that address equalisation of access to ICT appliances and connectivity, and that enable institutions to take advantage of such access.

Further, the differences between developed and developing countries in their capacity to develop content in the new forms that are emerging, create the potential for a form of "content imperialism" in which the developing world becomes the consumer of learning resources developed elsewhere. Some measures to avoid this could include:

- Arrangements in developing countries that ensure common standards for interoperability among institutions to enable them to share content databases and administrative systems.

- Allow institutions in developing countries to "cherry pick" learning objects from content databases and modify them with metadata, such as learning resources, that are appropriate in the local cultural context.
- Encourage the creation of regional partnerships among institutions in developing countries to undertake joint development of learning objects databases and to share the necessary technical infrastructure required to do that.

The experience to date with the development of distance education suggests there are several pitfalls that should be avoided. For example:

- Allowing decisions to be driven by the technology.
- Jumping on the "everybody is doing it" bandwagon.
- Overlooking existing educational and ICT systems.
- Underestimating the front-end and ongoing funding requirements.
- Unclear statements of objectives to be achieved.
- Raising unrealistic expectations.
- Failing to keep stakeholders briefed and involved in the decision process.

Epilogue

In spite of the tremendous increase in the use of ICT in education over the last few years, there are still very few examples, globally, of what one might call "pure" virtual learning. In other words, there are few examples in which all facets of the teaching/learning process are carried out through some type of ICT interface. Furthermore, most of the activity is still occurring around the edges of institutions, particularly the public sector institutions. As these situations continue to evolve and change, the Study Team believes they will be profoundly influenced by the macro developments that have been the focus of this report.

However, we disagree with the collective wisdom that is often associated with virtual education. This would have one believe that contact teaching, face-to-face interactions among learners, and the physical structures within which they occur, will become obsolete. On the contrary, our conclusion is that these macro developments are leading to greater diversity of educational models that will be more attentive to the needs of individual learners. In the process, they will help to address the needs of the many millions of people who currently have no access to any kind of educational opportunity.

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